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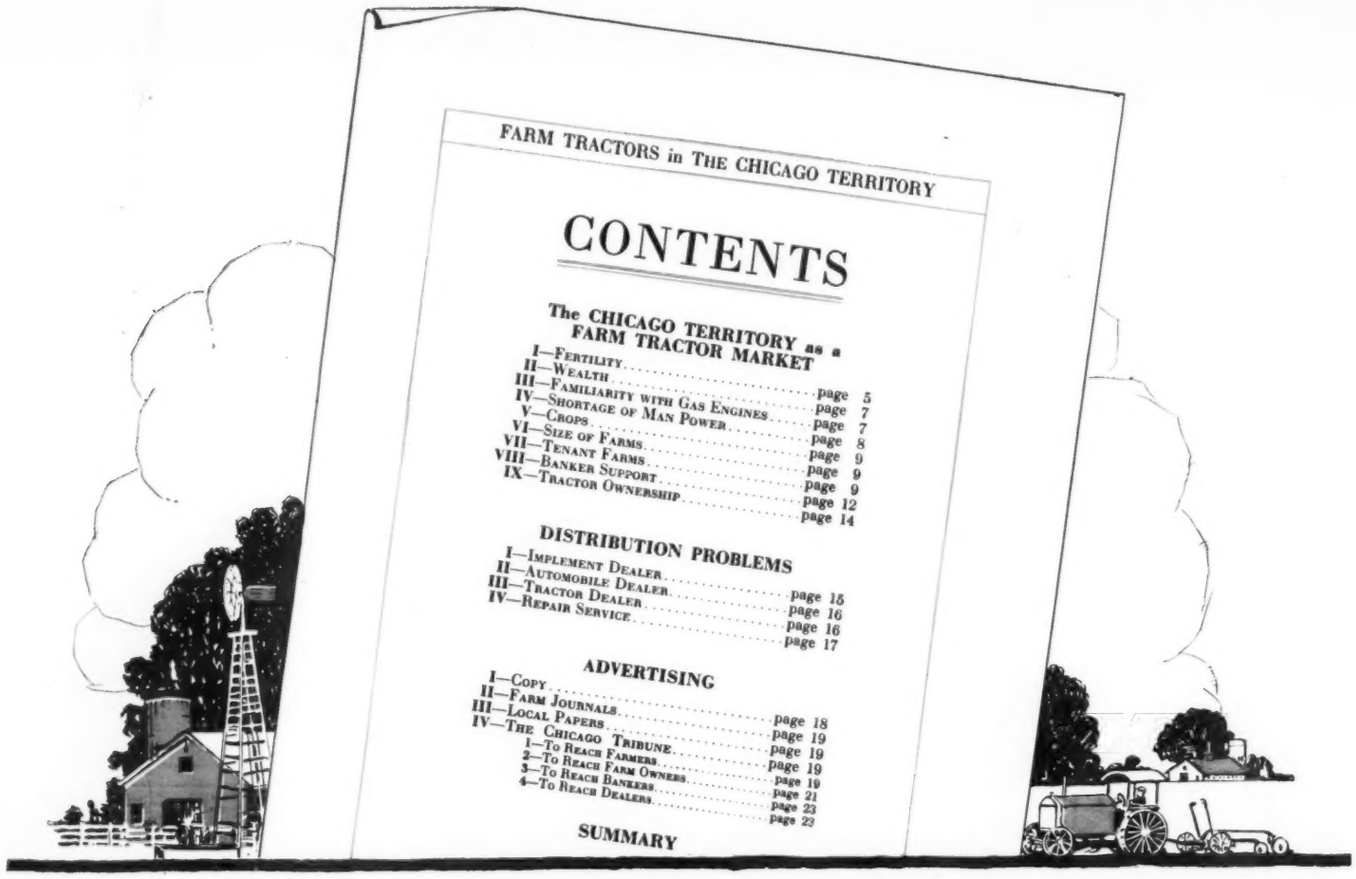


This is the Contents Page of

FARM TRACTORS

In The Chicago Territory

a discussion of tractor sales possibilities and sales methods in the five states of Illinois, Indiana, Iowa, Michigan, and Wisconsin — The Chicago Territory.

This booklet is the result of an investigation made by the Business Survey of The Chicago Tribune. It treats the conditions in these states, as a tractor market, the problems of distribution, and the proper methods of advertising.

If you are interested in any of the topics which appear on the Contents Page shown above

A request on a business letterhead will bring your copy

The Chicago Tribune

THE WORLD'S GREATEST NEWSPAPER

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLI NEW YORK—THURSDAY, JULY 3, 1919—CHICAGO No. 1

S. A. E. SUMMER MEETING

S. A. E. Reconstruction Meeting Analyzes Future Problems

The Passenger Car, the Tractor and the Tractor Engine Are Pictured Far Ahead—Ottawa Beach Declared to Be Ideal for Such Meetings and the Division of Day Into Business and Pleasure Sections Is Generally Approved

OTTAWA BEACH, MICH., June 27.

RECONSTRUCTION and post-war problems of automotive design, which constituted the cardinal features of the five-day S. A. E. summer session which was concluded here to-night, were well developed in the different sessions, which were so framed that one subject was discussed at each session. The 800 members and guests attended the sessions in goodly numbers, and it was rarely that fewer than 300 members were in attendance at any session, with the possible exception of the last day, which was attended by not more than 150 members.

The original plan of the meeting to give 50 per cent of the time for discussing the subjects, and the other fifty for the presentation of the papers, worked most satisfactorily, and for the first time in several years there was really a representative discussion of the topics scheduled. The plan of holding but one session a day, starting at 10 a. m. and continuing until 1 p. m., proved most satisfactory, and gave the members an ideal opportunity of getting acquainted, which opportunity they had not enjoyed during the last two summer meetings, which were conducted under war exigencies.

Many who did not participate in the daily afternoon program of sports formed into little groups and discussed construction and other problems in a way they had not had an opportunity to do since 1915 or earlier.

The meeting was an unqualified success, not only from the viewpoint of professional sessions and value of subjects discussed, but from the point of view of getting the members better acquainted and promoting an esprit de corps among the membership. No better place could have been selected than Ottawa Beach for such a meeting. The exclusive use of the hotel and grounds gave as good opportunity for the members meeting each other as if the session had been held on a Lake Huron steamer.

The meetings were exceptionally well attended in spite of bathing facilities, golf, tennis and the almost endless line of other sports that it was possible to follow, a fact largely due to giving over the afternoons to a sport program.

The series of after-dinner lectures on wireless telephony, war gases and motor transport proved of unusual interest, upward of 500 attending some of these. The added feature of war movies on the lawn, after dinner, added immeasurably to the interest of the meeting.

If there was one disappointment connected with it, it was that there was not as valuable and constructive a discussion on the future passenger car as was expected. It was hoped that when brief papers on this subject were

The hotel made an attractive setting and was popular

presented by such engineers as H. M. Crane, L. H. Pomeroy, Herbert C. Snow and W. B. Stout that literally a host of other engineers would have material enough to plunge into a 24-hour discussion, but this did not prove to be the case. Unfortunately, Mr. Pomeroy, Vauxhall engineer, from England, who is in this country endeavoring to make connections for the manufacture of his car, was absent, and there was keen disappointment on the part of many who had come to corner him, if possible, on his views concerning the desirability of a four-cylinder engine in preference to eight and twelve-cylinder types.

A. P. Brush, who was to have taken part in the presentation of this program, did not do so, apparently because the censors were not just satisfied with his paper.

Mr. Stout's 900-lb. five-passenger car was pretty generally ridiculed by the more conservative engineers, and he was styled as one of those long-distance dreamers. H. M. Crane took serious issue with his views, and did not see the possibility of a 900-lb. car for some time yet.

Jesse G. Vincent, Packard engineer, was one of the leaders in the free discussion, and cautioned the members against confusing what might be called an experimental

A morning session group

A group of women guests

design with the practical jobs that must be turned out by a manufacturing organization. He does not want to discourage dreamers of the future, but a car must be a practical, usable, manufacturing job.

E. H. Belden, who took part in the presentation of the future car, staked his hopes on the sleeve-valve-type of engine, coupled with improvements in spring suspension. His remarks largely applied to Overland design, which he has brought out in the last year.

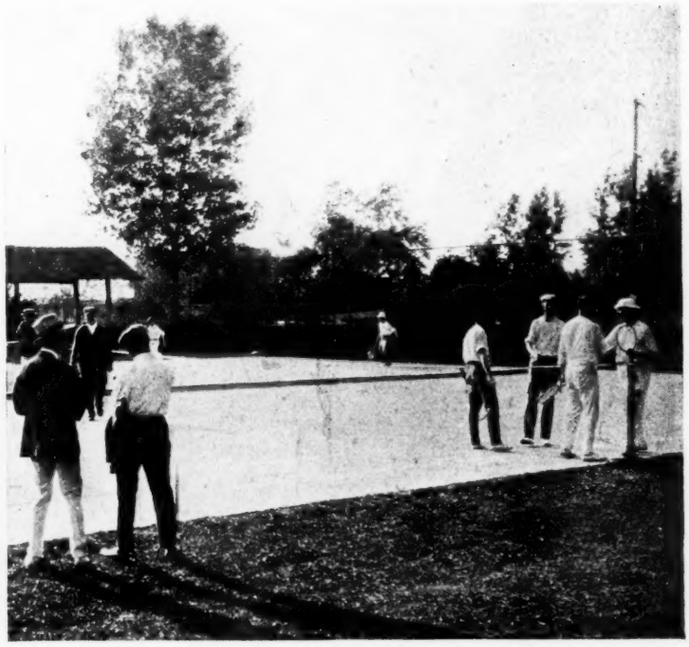
The general consensus of opinion resulting from the entire discussion was that the future passenger car is not going to be any radical creation, quite different from existing models, but that improvement will come in a step-by-step evolution.

There was no greater interest at any session than that of the last day, when Prof. C. A. Norman of the Ohio State University gave an illustrated talk of 65 minutes on future engine possibilities. His talk had to do entirely with the future. He was looking 50, and perhaps 75, years ahead. Professor Norman's business is to teach college students, and his paper dealt with Diesel adaptations, possibilities in compressor types of engines, development in turbine systems, and possibilities of new systems in prime movers. From start to finish the interest was unusually intense. Not a person left the lecture room, which is some record for an S. A. E. meeting.

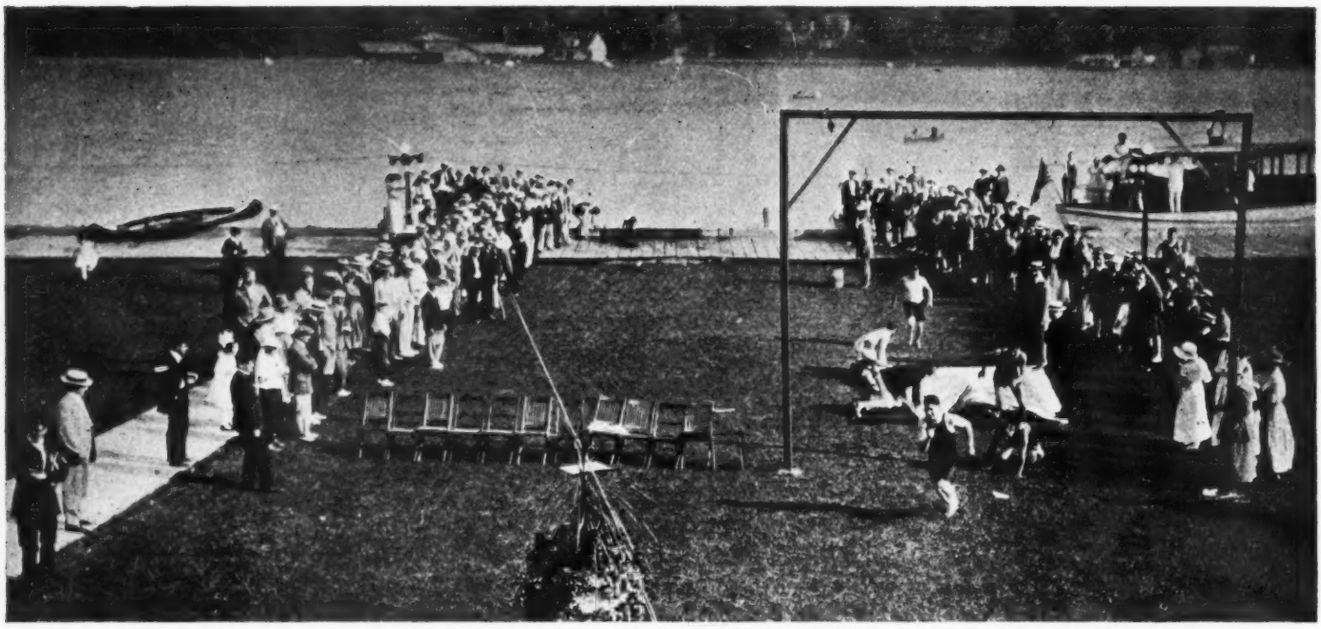
His paper served to bring out a real discussion, which was led by Henry L. Horning, Waukesha engineer, who presided. Horning was apparently aware of what Professor Norman might say, and, taking time by the forelock, entered into a rather lengthy dissertation of engine improvements before calling on Professor Norman.

Horning stands strong for improvement of existing types of engines rather than upsetting the atmosphere

Water sports were popular



The tennis courts were never idle

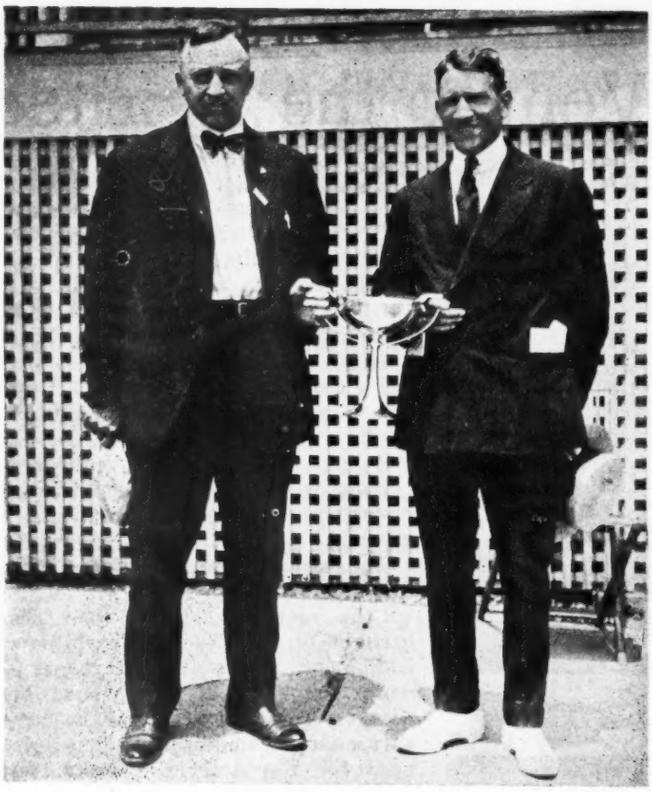


The lawn was ideal for the games

by introducing new types at this time. Apparently he expected Professor Norman to declare that existing types are hopelessly inefficient, and should be discontinued at once and he put in his word to forestall any such condemnation of present practice. There was no necessity, however, as Professor Norman spread oil over the troubled waters by declaring that the proper thing to do is to continue existing types but not to neglect the future, and to give good assistance to research engineers and educational institutions, so that they will be looking to and leading up to development that may be realities a generation hence.

The farm tractor session petered out, partly because it was staged the last day and also because there was no time for discussion. It constituted a twin subject with Professor Norman's dissertation on future engines, and when the professors got through there was not much time left for tractor discussion. The tractor program really totaled a paper by Professor White of Illinois State University, and a criticism of it by Prof. Mowry of the University of Minnesota. The two professors were about as diametrically opposite on many aspects of the tractor as it was possible to get. Professor White was in favor of harmonizing the tractor and the implement so that

The women took an active part in the sports



Cleveland's Baseball Stars
H. G. WELFARE, Catcher — H. G. FIGGIE, Captain and Pitcher

one man could make the necessary operational adjustments while the apparatus was in motion, and Professor Mowry thought that view a little idealistic.

Professor White favored hitching the plow to the tractor so that the front end of the plow was carried on the tractor, thereby eliminating the front wheels of the plow. Professor Mowry objected to this because it did not allow the plow to float in the soil as farmers declare it should when working properly.

The two professors locked horns in other respects. Professor White favored that design of tractor in which one or two of the wheels traveled in the furrow, and which gave straighter pull on the implement with less side draft. Prof. Mowry took the opposite view, on the ground that wheels in the furrow packed the subsoil and that the operation of the machine is not as satisfactory as it should be.

Both of the professors agreed that tractors should be better. They should be made of better material. They should be lighter. They should be more easily operated. They should be more reliable. Professor White claims that the average tractor life approximates 5 years, notwithstanding the fact that some tractor makers are declaring the life of their tractor to be 10 or 12 years. There may be a few of the 10 or 12-year type, but they are exceptions, and quoting them as typical examples is dangerous business.

Connected with the tractor field came up one of the sharpest discussions of the session. It took place in the meeting of the Standards Committee on the first day of the session when the tractor standards committee recommended that a new formula for horsepower rating be approved. There was much opposition to it on the ground that it does not give a true criterion of power output. The formula is based on engine dimensions and crankshaft revolutions. As such it is a measure of engine capacity but not necessarily a criterion of power output. When it came up for a vote in the Standards Committee the count showed a tie and Chairman B. B. Bachman refused to cast the deciding vote.

A solution was proposed to the effect that, instead of approving the rating, it might be desirable to recommend it as a suitable commercial rating for the National Implement and Vehicle Association, which is the largest organization of tractor makers. The demand for some new rating has been evident among tractor makers for some time, and the N. I. V. A. apparently desired the S. A. E. to make recommendations as to the best solution. The S. A. E. Council had a special meeting considering the subject and it was decided to refer the matter back to the Tractor Division of the Standards Committee for further consideration. Sentiment throughout the meeting was very divided and it will be some time before there is unanimity on this subject.

One view is that the new rating is quite conservative and if used by the manufacturers will be much better than the promiscuous ratings at present in use. At the same time it is recognized that this rating is not a satisfactory one when a fair measure of power output is sought.

The question of holding an exhibition of automotive parts in connection with the summer meeting of the S. A. E. was on the program but was briefly discussed. There is a growing sentiment among engineers that it would be highly desirable if there could be a well-controlled exhibit of new components and accessories, providing the exhibit was so regulated as not to interfere with the sessions when papers are read and also providing there was an ample censorship so that over-zealous salesmen would not be pestering the lives out of the engineers during the meeting.

Economically, such an exhibit should be ideal, as it would let the engineers see all of the new components and accessories at one time and make it possible to compare these, which is scarcely possible to-day.

One suggestion in connection with such an exhibit was that all axles could be placed in one part of the exhibit, thereby making examination and comparisons unusually easy. Other components in accessories could be grouped similarly.

A serious problem to consider in connection with staging such an exhibit along with the summer meeting is that of securing accommodation for such an exhibit at a suitable place for holding the summer session. Atlantic City has been suggested as a possibility,

(*Continued on page* 30)

A salute of 21 *guns in honor of peace ended the meeting*

Everybody Went to the Spirited

Eight-inch howitzer mounted on tank going over rough ground

The biggest British tank entering a cellar excavation

Two-man tank showing ability to cover rough ground

THE exhibit of motorized Ordnance Department equipment at the S. A. E. summer meeting was a unanimous affair. Everybody attended and all were pleased. The thrilling and instructive exhibition was arranged in Jenison Park, an amusement ground just across Black Lake from the Ottawa Beach Hotel, where more than 800 persons attending the Summer Meeting were stopping. Also a large number of persons who lived in the neighboring towns accepted a general invitation to attend.

The exhibition was a complement to the technical Army and Navy session of the morning. There had been brought to the Beach 30 carloads of equipment, which included types of motor equipment of both friends and foes, the former loaned and the latter surrendered, in addition to that developed for the American Army. An added feature was a concert by a band brought from Grand Rapids.

An interesting apparatus was a cargo-carrying tracklayer type vehicle provided with wrecking crane which was demonstrated by lifting a two-man tank off the ground. This machine is built on the Mark VIII land cruiser frame and consequently has a Liberty 400-hp. engine.

The two German tractors exhibited were made by Lauz of Mannheim and were used for hauling and placing in position heavy field pieces. One of them has a 4-cylinder and the other a 6-cylinder engine and the latter is known to have been used for manoeuvering the heavy 42-cm. howitzers concerning which there was much discussion in the early part of the war.

The four-cylinder engine has its cylinders cast separately and is generally of very substantial construction and well finished. The weight of this smaller tractor is about nineteen tons. Three grades of fuel are used on each tractor, gasoline for priming, distillate for warming up the engine and another fuel—probably benzol—for regular operation. The cylinders are primed through tubes leading from the priming tank to each of them. The radiator fan and water pump are mounted on the same shaft and driven by a flat belt.

The engine runs at 700 to 750 r.p.m. and drives through a three-speed and reverse gear, giving the tractor a maximum speed of 9 to 10 m.p.h. There is one lever controlling two of these speeds and a second lever for

Exhibit of Motor War Equipment

the other two. These two levers are interlocking. Steering is by a large wood-rimmed hand wheel and the brake is applied by another hand wheel. The final drive is by internal gears.

There are two very substantial drop sprags at the rear, which are evidently required to give the tractor a firm anchorage when maneuvering heavy guns by means of the winch. This winch has a sheave on a vertical shaft on which there is a steel wire cable which in use is guided between horizontal and vertical rollers, of which there is one set at the rear and another at the side.

The six-cylinder Lanz artillery tractor differs in a good many respects from the four-cylinder machine of the same make and evidently is a later model. To all appearances it is a very well-designed machine and the demonstration shows that it handles very easily. It was taken by the American forces near Verdun. Its cylinders are cast in pairs and its magneto and pump are driven from opposite ends of the same cross-shaft.

The main fuel tank extends over the engine, this location evidently being chosen to keep the fuel as warm as possible.

Back of the main tank and to the rear of the dash board there is another tank with three compartments, one containing distillate for heating up the engine when starting, another one oil and the third one water which is used to cool the clutch when the machine pulls very hard and the clutch heats up. The oil compartment is provided with a hand air pump and with a pressure gage, which latter shows the amount of pressure on the oil.

The frame is of pressed steel and the wheels are of the same material, being made in halves. Over the center of the pressed steel wheel there is a heavy nearly square-sectioned steel rim. This is much narrower than the wheel itself, so that when the wheel runs on hard, paved roads it has a narrow contact surface, but when it sinks in the contact surface becomes much wider.

The road wheels of this tractor run on floating bushings. Coiled springs are located in the steering heads over the knuckles and the knuckle joint is lubricated through this spring housing. The drive is by internal gear, enclosed.

The American engineers have fitted

(*Continued on page* 10)

Mark VIII, designed by Col. H. W. Alden, is biggest U. S. tank

The Mark VIII going through a cellar excavation

Track layer tank picking up a two-man tank

S. A. E. SUMMER MEETING

Army Officers Hope to Continue Work with S. A. E.

IT always is pleasant to hear words of appreciation—S. A. E. Members probably were fully aware of what their fellows had done to help the allied arms to victory, but they enjoyed the message of appreciation delivered to the society by Maj. Gen. Williams, of the Ordnance Department. The session was made doubly enjoyable by the telling of the story of the development of the NC flying boats and others.

OTTAWA BEACH, MICH., June 27.

MEMBERS of the S. A. E. heard many nice things about themselves during the professional session of the Summer Meeting. This session was talks and papers of a military-automotive character. Maj.-Gen Williams of the Ordnance Department, the chief speaker at this session, said that he had come to the meeting to express acknowledgment of the debt the Ordnance Department owed to the members of the society.

Major Eames of the Army presided. In the absence of Commander J. C. Hunsacker his paper on "Development of NC Boats and Other Naval Aircraft" was read in the abstract by Charles M. Manly, president of the S. A. E., and who, until recently, was consulting and chief inspection engineer of the Curtiss Aeroplane & Motor Corp., and consequently fully informed of the development of this craft. Mr. Manly interspersed his review of the paper with remarks based on his personal experience in the line of flying boat development.

He said that the Curtiss Aeroplane & Motor Corp. during the winter of 1915-16, built a large triplane known as the T-Boat, which had a wing spread of 135 ft. and was equipped with four 300 hp. engines. One of these machines was built and an order for nineteen more was received from the British Government, but before these could be delivered orders were received to stop work on them.

The reason for this, he said, was that the Germans at that time had gained the ascendency with smaller seaplanes and the British were afraid that the big, unwieldy machines would be attacked by the smaller craft and would be unable to defend themselves.

Col. Miller of the Motor Transport Corps read a paper on the organization of that corps during the war, and on plans for the proposed peace army.

Capt. Costello, who is attached to McCook Field, where he has charge of specifications and standardization, made a few remarks and urged co-operation between the S. A. E. and the Army Aeronautical Department.

Gen. Williams, when introduced, said he was present to express the debt of the Ordnance Department for the very valuable assistance it had received from the S. A. E. At the close of the war, the Department was in possession of about 40,000 vehicles, and between 400 and 500 automotive engineers were attached to it. The greatest single factor in the winning of the war, he said, had been the internal combustion engine and its derivatives.

Tactics entirely depended upon army equipment, and the development of army organization and its dependence upon equipment could be traced from the time of the Roman legions.

CHRISTIAN GIRL,
of Standard Parts Co.

MAJ. GEN. C. C. WILLIAMS,
Chief of Ordnance

The tank was a very valuable acquisition to military equipment brought forward during the late war. Its value was not universally recognized at first, due perhaps to the fact that the military mind was a rigid mind, but there could be no doubt that it would have a very important part in future military campaigns. The U. S. Army had developed three types of tanks, small, medium and large, respectively.

Of these, the Mark VIII tank was the work of Col. H. W. Alden of the S. A. E., and Gen. Williams paid a glowing tribute to Col. Alden. The latter had first gone abroad to obtain all the available information on the subject and then had designed the best possible tank for the purpose in hand.

Reference was also made by Gen. Williams to the mobile repair shops and to the heavier repair shops, both of them mounted on motor trucks. The efficiency of the repair equipment he said, had been proved by the fact that from 97 to 98 per cent of the guns had been in action.

Another development was the artillery tractor which was destined to entirely revolutionize artillery practice. It had probably been observed by the audience that all of the armies had a 3-in. or 75-mm. field gun. This was due to the fact that the weight of a 3-in. gun, about 4500 lbs., is practically the limit which can be drawn by six horses with the desired degree of mobility. For hauling

6-in. howitzers, eighteen-horse teams were formerly used, with less mobility. The draft which a single horse can exert is definitely limited, and there are also limitations on the degree to which these power units can be combined. There are no such limitations with the tractor.

He regarded it as fortunate that the army, during the year before the war, had designed artillery tractors of 5, 10 and 15 tons capacity. Everybody now recognized that the motor tractor was the coming thing for moving artillery. There were two general solutions of the problem, one consisting in hauling the gun behind a tractor and the other in carrying the gun on the tractor itself.

The late war clearly demonstrated that it is possible to train the requisite number of soldiers and officers in a much shorter time than that required for manufacturing the necessary equipment. There is now much discussion of the problems of preparedness, but in all this talk reference is generally made only to the subject of personnel, while that of material is entirely neglected. The personnel is only the smaller end of the problem, there being a much greater need for a thorough industrial organization.

At the end of the war, the Ordnance Department appointed a special board to visit Europe and study problems of armament and transportation in the Allied countries. When this committee makes its report, although it will be of a secret nature, it will be laid before a committee of the S. A. E. for advice regarding the problems that will arise out of it.

In conclusion General Williams said that the Ordnance Department wanted to maintain the same cordial relations with the S. A. E. that existed during the war. He considered it highly desirable that all officers of the department should become members of the society to enable them to keep in touch with developments in automotive engineering. At the present time the army regulations forbade officers joining such organizations and there were no provisions in the regulations of the army for defraying the expenses of membership, attendance at meetings, etc. The General hoped, however, that Congress could be induced to so alter the regulations that officers would be in position to join the S. A. E.

COL. L. B. MOODY

PRESIDENT C. M. MANLY

GEO. W. DUNHAM
of the Militor Co.

COL. MILLER
of the M. T. C.

Upon the conclusion of General Williams's talk, the paper by Commander Hunsaker was thrown open to discussion. In opening the discussion, Mr. Manley stated the reasons for adopting the peculiar design of the boat. He said that the stepped bottom of the boat was necessary to permit of the "take-off" from the water, and the V form of the bottom was to break the landing shock.

R. H. Upson, who has been in charge of the development of lighter-than-air craft during the war, made a brief comparison of the NC flying boats with a dirigible airship designed for the same purpose. The comparison was made on the basis of equal speed and equal lift. Following are some of the dimensions and characteristics of the two machines:

	Flying boat	Dirigible
Length	68 ft.	260 ft.
Breadth	126 ft.	60 ft.
Height	25 ft.	70 ft.
Total lift	28,000 lb.	28,000 lb.
Weight, empty	12,000 lb.	12,000 lb.
Maximum speed	84 knots	84 knots
Average speed	61 knots	61 knots
Total range—		
At maximum speed	1010 knots	760 knots
At cruising speed	1420 knots	1510 knots
At low speed	1630 knots	
Horsepower required—		
At maximum speed	1600 hp.	2000 hp.
At cruising speed	848 hp.	780 hp.
At low speed	780 hp.	200 hp.

Mr. Upson said that, as regards speed, the airplane was superior but from the standpoints of carrying capacity and range of action the dirigible was in the advantage.

Referring to the statements in Commander Hunsaker's paper regarding materials used, Mr. Manley said that spruce had proved the most valuable material for airplane construction. Douglas fir was the next best wood. In the beginning the British and American aircraft departments wanted nothing but solid beams, but later they were glad to accept laminated parts. In a flying boat, the greatest amount of power is required when taking off the water.

The question was asked why, on the NC boats, one of the engines was arranged as a pusher—whether it would not have been possible to make all four engines tractors. This was answered that almost any arrangement was

possible, that all four engines might be made tractors or two might be tractors and two pushers: the reason for the arrangement finally used on the NC boats was that they were originally designed as three-engine machines, and when it was found that three engines were insufficient for the take-off, the easiest way to install a fourth engine was to make it a pusher and mount it on the extended engine bearers of the central engine. Where two engines were mounted tandem, one as a tractor and the other as a pusher, the propeller of the latter was always given a larger pitch because it has to operate in the slip-stream of the forward engine. Moreover, a pusher engine is more effective than a tractor engine for getting the boat off the water, as there is less obstruction to its slip-stream.

Christian Girl of the Standard Parts Co. said that the greatest trouble in Washington had been the lack of a common knowledge necessary for getting the motor transport under way. The proposal had been made to standardize military motor equipment, and he desired to warn against the standardization of anything that would be obsolete in five years. Officers of the Transport Department should become members of the S. A. E., and he suggested that a committee be appointed to confer with the Secretary of War for the purpose of working out a plan whereby army men could benefit by the studies of the Society.

Mr. Girl said that as a result of his experience at Washington, he had the highest respect for the West Pointers. He had seen them take demotions and smile, and he had also seen them receive promotions and keep on smiling in the same democratic way. Mr. Girl urged that we should be absolutely prepared the next time from an industrial standpoint.

George W. Dunham pointed out that the Bureau of Standards had largely co-operated with the S. A. E. and the industry during the war. When war was declared, the War Department turned to the automotive industry and the accomplishments of the industry for the Government had been a great help to the industry because, under commercial conditions, the Government would never have seen the wisdom of spending the money that was spent by the army for development work.

MAJ. EAMES
Presided at the Military Session

HERBERT CHASE,
Assistant Secretary

Everybody Attended the War Equipment Demonstration

(*Continued from page* 7)

One of the pieces of ordnance equipment built for our own army is a 2½-ton ordnance tracklaying-type tractor with Cadillac 8-cylinder engine. In the design of all ordnance tracklaying-type vehicles the aim has been to limit the ground pressure to 5 lb. per sq. in. This tractor was designed chiefly for hauling 3-in. or 75-mm. guns, and takes the place of 6-horse teams for various kinds of work. The complete Cadillac unit power plant with three speeds and reverse gear box is used, and the machine is geared for a maximum speed of 12 m. p. h.

The writer was told by Colonel Moody that this tractor presented one of the hardest design problems the Ordnance Department had to solve, as it was necessary to combine comparatively high speed, light weight and the ability to travel over ground full of shell holes.

A standard 5-ton tracklayer tractor was designed for hauling 6-in. (155-mm.) howitzers or any other loads up to 5 tons. This tractor is equipped with a modified Class B truck engine, valves in the head being used, and the compression ratio increased so as to obtain about 10 per cent more power.

The oiling system was changed, a bigger fan with wider belt fitted, and a magneto with impulse starter is used for ignition. It may be pointed out that this is the standard ignition equipment of the Ordnance Department; practically all of the engines used are large and do not admit of spinning, hence the impulse starter greatly facilitates starting of the engine.

The American engineers have fitted two double Kingston carbureters to this tractor for using gasoline and kerosene alternately. A fabric type air filter is used. The crankcase of the engine is of aluminum, and the liberal use of this material in the German trucks exhibited indicates that it was not scarce in Germany.

Much interest also attached to the portable machine shops exhibited. One truck carried a complete shop outfit, including lathe, drill press, grinder, etc., and is intended for operation close behind the lines. Another shop made for the Ordnance Department comprises 12 four-wheel tractors and an equal number of trailers. Each vehicle, as a rule, carries only one machine.

Adjacent to the park there was a vacant lot where a house had been burned, and the Mark VIII and V tanks went in and out the basement, demolishing the basement walls. Trees were also knocked down by the tanks, the fact that the trees adjacent to the burned house, which were of very respectable size, had been killed by the fire, admitting of doing this without damage.

S. A. E. SUMMER MEETING

How the M. T. C. Kept the Army Truck Line Moving

THERE was a continual shortage of parts, materials and mechanics, Colonel Slade told the S.A.E., and an abundance of variety in makes of vehicles, but the Americans exercised ingenuity, took long chances and kept a line of vehicles going to the front with food, clothing and ammunition for the soldiers on the front line.

HOW the Motor Transport Corps overcame difficulties and kept the army supplied with food and fighting material was told by Lieut.-Col. A. J. Slade in a lecture, that at times became a thrilling story. Colonel Slade was an officer of the corps and later was a member of the Armistice Commission.

He said that at no time prior to the signing of the armistice was the shipping available to the M. T. C. equal to its need. There never were enough trucks received for the work in hand, nor were there adequate facilities for handling them after they reached France. Upon the arrival of trucks in France, they were driven to the reception parks, where they were thoroughly inspected. These reception parks were evidence of the ingenuity and resourcefulness of the M. T. C. officers. At St. Nazaire, for example, there was only one building constructed of brick and steel. All the other structures used for M. T. C. work were built of packing cases.

Lieut.-Col. A. J. Slade of the M. T. C.

From these parks the trucks were driven overland to the point of service for the American army. Usually this was a distance of several hundred miles. Lack of trained drivers and mechanics often made this trip a serious undertaking. Quite frequently only a part of the vehicles started in a squad and would reach the destination.

The British and the French had less trouble in this connection, as their army bases were much nearer points of debarkation. On reaching the front, the trucks were again subjected to inspection, overhauling and adjustment.

One factor that enhanced the difficulties of the M. T. C. was the great diversity of trucks in use. In one division of the army there were 20 makes, including American, British and Italian, with many of which the mechanics were entirely unfamiliar and personal ingenuity often went far to keep the trucks moving.

Trucks were assigned to all branches of service, chiefly supply trains, ammunition trains and sanitary work. Often they were used to supplement the ambulance work.

A great deal of the damage suffered by the trucks was the result of inexperience of the personnel. Minor injuries and all simple adjustments were repaired in the field directly behind the lines. In this connection great use was made of the mobile repair shops. In the case of more serious injuries the trucks were taken to established repair parks farther back of the lines. In addition to these shops there were established overhaul parks, the purpose of which is sufficiently defined by the name. Often in these parks a practically new truck was made out of parts of wrecks.

The M. T. C. was continually handicapped by an insufficient number of competent mechanics, lack of material, and universal shortage of parts, which was only overcome by personal ingenuity.

There was a general reconstruction depot in the center of France. Often when the trucks reached this depot they lacked important parts, as, for instance, a magneto. Frequently there was no magneto in stock that was ever known to have been used on this kind of truck, so the need was supplied as best it could be.

As soon as the armistice was signed the pendulum swung in the opposite direction, and there was a surplus of trucks, also of material.

Col. Slade said the question of which truck stood up best was a very delicate one, and opinions differed. Data that might answer this question were being prepared.

It should be a matter of great satisfaction to American automotive engineers, however, that the British considered one American make the best truck in their service, and the French so regarded another American make.

At the conclusion of his talk, Colonel Slade showed several reels of moving pictures illustrating the work of the M. T. C. in France and incidents connected with the war.

S. A. E. SUMMER MEETING

Engineers Discuss "Better and More Efficient Car"

ONE point is certain, the owner is to have much to say about this future car. The builders chiefly are anxious to learn what the buyer wants, rather than what he needs. The trend is against the multiple cylinder engine and favors saving weight and material wherever it is possible to do so without destroying comfort.

OTTAWA BEACH, MICH., June 27.

"WE want better and more efficient cars," said Chairman Joseph Anglada, as he opened the discussion on the future passenger car at the S. A. E. summer meeting. The chairman's remark was the keynote of the discussion which followed. The papers which preceded the discussion were printed and digested in AUTOMOTIVE INDUSTRIES for June 26.

While the views of the engineers varied considerably, the desire for better and more efficient cars expressed by the temporary chairman was borne out by all who took part. Those who entered the discussion had individual viewpoints, owing to their activities in building cars of different prices and classes, but a perusal of the discussion which followed the papers throws much light on future development. The discussion was particularly frank, and while to some extent the views of some of the engineers may be classed as visionary, nevertheless they were intended to shed a light upon the future pathway of development. The discussion follows:

E. H. Beldon, Chief Engineer Willys-Overland Co.:— "There are three fundamental necessities for the future car. It should possess efficiency, appearance and comfort. The car will have to possess these characteristics in order to fulfill the wishes of the public, and as far as comfort is concerned, we believe that we have worked out the new spring suspension which will revolutionize car suspension. This car, though weighing but 1800 lb., can travel 60 miles per hr. over roads of medium quality. While it only has 120 in. wheelbase, it has 130 in. spring base, which gives it the desired riding qualities.

"I believe the time is coming when all cars will have to pass a government inspection for roadability for a given weight, and cars will only be permitted to travel below a definite speed, depending upon their roadability. Personally, I believe the four-cylinder sleeve type of engine will prevail, and I think the sleeve valve construction is sure to replace the poppet and particularly the overhead construction. The valve adjustment on a tappet engine is always inaccurate and the valves seat differently when the engine is hot and when it is cold. The lubrication of an overhead valve mechanism is difficult. We will eventually build nothing but Knight engines.

"I do not believe there is any future for 8-cylinder cars because of the cross vibration, and I do not believe there will ever be any great market for the twelve-cylinder car because of its high cost and inefficiency.

"What we desire on a car is solid, substantial sheet metal work, a high center of gravity, but good appearance due to lowness, wide doors on sufficient wheelbase, minimum vibration, good throttling, minimum weight, maximum roadability, and tires 4 in. in diameter, or less, in order for them to pass through any sort of ruts without wedging."

J. G. VINCENT, of the Packard

E. H. BELDEN, of Willys-Overland

William B. Stout, United Aircraft Corp.:—"The development of airplane materials has opened up possibilities in motor car construction which have hitherto never been thought of. The new materials give us a new alphabet with which we can spell new words. We have developed a plane having 40 sq. ft. more wing surface than the DeHaviland and weighing but 1550 lb. against 3400 lb. This has been largely due to the use of plywood. Improvements in glues makes this new material far more reliable than anything of that nature previously developed. With it we have constructed a girder weighing but 15 lb. and 18 ft. long on which 1 ton of lumber was piled without any permanent set occurring, and even then, it was not overloaded. It would be possible with this material to build a four-passenger body weighing but 52 lb."

E. S. Foljambe, of the Chilton Co.:—"There are several matters in which the present day car could be improved. I do not believe it is right that road dust should be taken into the engine in the way it is. We filter the air for tractors and the same should be done for passenger cars; in fact, for all internal combustion engines. It is a known fact that much of the material which enters the cylinder and is classed as carbon is nothing but road dirt.

"It is also suggested that the removable head be made more accessible. For instance, it would be better to have a flange coupling at the hose connection so that it is not necessary to take off and put on the hose connection when removing the head. In body work, particularly of the closed type, better provision should be made for lowering and raising the windows. The posts on the fixed top body are too heavy and nearly all of the windshields leak.

"I would also make a plea for the fool-proof battery. The present type of battery can be ruined by ordinary use. A man who does not do any night driving at all can spoil his battery completely by overcharging.

"I also believe that spring suspensions could be considerably improved if the leaf spring should be covered and not submitted to the action of dirt. The spring should be lubricated."

W. J. Parrish:—"I want to make a plea for the steam car. It has an ability to burn low grade fuel and road qualities not possessed by the internal combustion engine. The previous objections to its use were, fire danger, water shortage, short boiler life and insurmountable difficulties with automatic control. A steam car to be successful should possess the following qualities: 1—A working head of steam in less than 1 min. and this secured by turning a switch; 2—Operation on kerosene or fuel oil ignited by means of a spark plug; 3—Long life boiler, preferably of the semi-flash type; 4—Simple control for fuel and oil pumping, possibly by an electric motor which would cut in and out as necessary.

"The cone tube type of boiler with the fire inside is a very safe type because the tubing absorbs the heat and does not permit flame to pass outside of the confines of the boiler."

F. E. Moscovics, Nordyke & Marmon:—"We must not confuse the experimental with production work. The 1800 and 900 lb. cars predicted are of necessity in the remote future and we must not confuse them with practicalities."

J. G. Vincent, Vice-President, Packard Motor Car Co.:—"The papers presented herewith on the future cars might be classed, 'Important if True.' We must not confuse research work with current production. I would go further in criticising Mr. Pomeroy's paper if he were here, but I might tell a little story on him even in his absence.

GEORGE W. SMITH, of Nash Motors Co.

JOSEPH ANGLADA, Chairman of Session

"Mr. Pomeroy was talking with H. M. Leland, asking him how he ever came to make such a great mistake as to manufacture an eight-cylinder car, when the four-cylinder type would have done just as well if not better. Mr. Leland replied, 'Mr. Pomeroy, you are a man after my own heart and I quite agree with all of your statements. The only thing that you have overlooked is that we were able to sell an eight-cylinder car, whereas we would not have been able to sell the four.' This illustrates a point which I have in mind and that is that the engineer should be a 50 per cent engineer and 50 per cent salesman.

"I do not believe that this country is going entirely to economy, although it was strenuously preached during the war. There will be three sizes of cars, the small, medium and large. The four-cylinder motor will be very largely used in the smaller cars, the four and six in the medium and the six and twelve in the heavier cars.

"Probably, if the necessary apparatus were put into the four-cylinder engine to balance it, it would be as complicated as the multi-cylinder type. The biggest step that will be taken this year is to make it possible to start easily on low grade fuel."

David Fergusson, Chief Engineer, Pierce-Arrow Motor Car Co.:—"I believe that Mr. Pomeroy's paper is unquestionably very timely. All makers are now working on new models and now is the time for discussion of new ideas. We have never observed any particular inconvenience due to torque recoil, pointed out in Mr. Pomeroy's paper."

A. L. CLAYDEN
Consulting Engineer

W. B. STOUT
Looked Way Ahead for a Car

F. E. Moscovics, Nordyke & Marmon Co.:—"Referring to Mr. Belden's discussion, I would like to know if he expects to balance the four-cylinder engine by the use of sleeves."

E. H. Belden, Willys-Overland Co.:—"In reply to Mr. Moscovics, the four-cylinder engine can be better balanced only by reducing the weights of the reciprocating parts."

George Smith, Engineer Nash Motors Co.:—"After you have a car designed you have to build it, and much depends upon the kind of men you can get. If you want quality cars you have to train men. You can never get a better engine than the workmanship which is put into it.

"We do not appreciate what the automobile has become because we are too close to it. The workmanship to be found in automobiles compares very favorably with machine tool work. In riding qualities, the heavier the car is the better it rides, within limits. It is not necessary to have high horsepower to secure high speed. The maximum speed a man wants to run is somewhere around 45 miles an hr., but it is necessary to have a reserve over this in order to meet all his requirements. Regarding the four and six, the four-cylinder engine does not develop its torque at low speed. A six-cylinder engine can be throttled down as low as 80 r.p.m. and develop two-thirds of its full torque."

A. L. Clayden, Engineer, Brewster Bros.:—"I would like to follow up J. G. Vincent's remarks in reference to Mr. Pomeroy's paper. It is hard to define national ideas in a car and I do not believe that Mr. Pomeroy has fully absorbed the American idea as to the use to which cars are put. France, England and America all vary in the national ideas of motoring. In this country we are not selling motoring when we sell a car, but we are selling transportation. Up to 1914, 75 per cent of the motoring in Europe was of a pleasure nature.

"I believe the size and weight of automobiles will decrease as road conditions improve. The road is the limiting factor. The car which would be ideal for paved roads is a different sort of car than is required over the rough roads in the country. I believe that the production of lighter cars intended only for good roads would encourage better roads. There would be a market for these cars around cities where they would never have to go off the paved highways."

W. B. Stout, United Aircraft Corp.:—"I disagree with the statements which have been made on the weight question, particularly where stated that the heavier cars ride best. It is possible to reduce unsprung weight, and the lighter the car, the better riding it can be made. This is true because the less the weight of the car, the less the throw, and the ratio of total weight to unsprung weight is the determining factor. The reduction of the weight of unsprung parts in reference to the weight of the passengers is also highly important because this stops the throwing action. In other words, if the unsprung parts weighed nothing, the throw on the passengers would be practically zero."

L. M. Stellman, H. H. Franklin Mfg. Co.:—"We have been building light weight cars for a great many years and we agree with Mr. Stout that better performance and better riding comfort can be secured from the lighter vehicles. We believe in air cooling, although it has its limitations. The big question which we would like to have answered is exactly what speed the average man wants to go. If we knew this we would find our designing much easier. If men did not go over 15 miles an hr. it would be smiple to design a car for that speed. If they want to go 75 miles an hr., we can design a car for that speed, but the question which we should have fixed is what is the maximum touring speed. The average is probably not over 50 miles an hr. as a maximum, although some want between 60 and 70."

E. W. Coble, Manager E. W. Coble Co.:—"I drove a car to Ottawa Beach from Toledo, this car weighing 4,000 lb. We made 142 miles on 5 gal. of gasoline with an engine rated at 15 hp. We drove as high as 32 miles per hr., with a four-cylinder 2¾ by 4¾ engine. It is a gasoline electric with the electric part cut out."

Pre-ignition Due to Overheated Spark Plugs

CONDITIONS of spark plug operation are very severe in air-cooled, high-speed motorcycle engines. A writer in a recent English engineering publication describes a demonstration given him at a motorcycle factory bearing on this point. When plugs with long, thin electrodes, or even with long, thin porcelain skirt, were used, the engine would pull up, with all the symptoms of a seized piston or bearing, after from one to two minutes' running on full load at 3000 r.p.m. Yet when the priming cocks were opened the engine would be found to be perfectly free, and would indeed start up and run for another few rounds as if there was nothing wrong. The trouble was simply due to violent pre-ignition caused by incandescent electrodes. With one plug the engine slowed down for a few seconds, till it almost stopped, and the incoming charge cooled the electrodes down so that the engine raced away again at full speed for another period.

S. A. E. SUMMER MEETING

Looking Far Ahead with the Tractor Engine

WHAT of the tractor engine of 50 years hence? This picture was drawn for the S.A.E. Members assembled at Ottawa Beach. The artist did not advise immediate and radical changes, but he did draw a distinct view of the future. In the discussion the men chiefly concerned with the engines of to-day applied these theories to the task in hand.

OTTAWA BEACH, MICH., July 27.

WHEN the program for the summer session of the S. A. E. was being framed as a reconstruction one, it was decided that one session should be given over to the future of the explosion type engine. A search was made for some scientist who would take a telescopic view of the engine. Fundamentally what was wanted was the long-distance vision of the scientists who are working in their chemical and physical laboratories. To propound such a view, Prof. C. A. Norman, of the Ohio State University, was selected for the task. Prof. Norman is in charge of machine design and is well versed in scientific research. He has followed very closely chemical research work and is familiar with the progress of the European scientists.

With this thought in mind, it was not surprising that practically all of his 65 minutes occupied were given over to the explosion engine, not of the immediate future, or not of 10 years hence, but perhaps of 50 or 100 years hence. The professor made no effort at eulogizing any particular type of engine, but analyzed his field and illustrated his talk with lantern slides showing different types that have rarely gotten further than the experimental laboratory.

He was entirely in sympathy with our manufacturers continuing the manufacture of practical engines, such as to-day, but believed that the universities must give the students a thought of the possibilities that may be realities a generation or 50 years hence.

It was fortunate that Henry L. Horning, chief engineer of the Waukesha Motor Co., should have been selected to preside at such a meeting. He has taken an unusually deep interest in engine development, and has made a reputation for himself in research and laboratory work. Before giving Prof. Norman a chance to take possession of the meeting, Horning took advantage of the occasion to express his opinions regarding engines of to-day and future possibilities. In referring to present manufacturing practice, he said:

"It is a common practice to drill a circle of oil holes at the bottom of the third piston ring, which was intended to prevent oil from finding its way into the combustion chamber, there to be burned and forming carbon deposits. Actually this series of oil holes is one of the greatest causes of crank case dilution, as has been incontestibly proven by experiments conducted to that end."

He advocated the use of wider piston rings, as with the tendency of our present low-volatility fuels to condense in the cylinder and cut the lubricating film on the cylinder walls, the life of the ring is entirely too short. We had about the same condition in bearings, which some manufacturers made with numerous oil grooves, while others made no grooves at all.

In a 5-in. bore, four-cylinder engine, he had been able to obtain a mean effective pressure of 95 lbs. to the square inch, corresponding to 56 hp. at 1000 r.p.m. In all attempts to increase the brake mean effective pressure it was found that the temperature of the center of the piston head was the limiting factor.

Horning voiced the opinion that in the near future there would be a very material increase in the price of kerosene, which fuel is sold below the price level which the relation between supply and demand would permit of. Then many of the users, now burning kerosene, would turn to gasoline. Personally he had no fears regarding the turn of events in respect to fuel.

Reverting to the fuel situation, Horning said that a research committee had been formed and that Dr. Dickinson of the Bureau of Standards would conduct a number of investigations, the first problem to be taken up being the maximum compression pressure permissible with different grades of fuel. In addition to the research committee there is about to be constituted a committee on burning our present grade fuels in our present engines, and a call for volunteers to serve on this committee is to be issued. The committee wants information, and any one knowing of any methods or means for utilizing our present fuels to better advantage was invited to communicate it to the committee, which would collate all such information and subsequently publish it in pamphlet form.

Prof. Norman's paper dealt mainly with radical innovations in engine design, but he felt that it was wise to stick to our present type of engine, not only because we had learned so well how to make these engines, but also because the farmers knew how to operate and take care of them. In this respect the Ford car had been a good missionary, as it had taught the farmer how to grind valves, pour oil into the crank case and attend to other duties in the line of keeping the engine in good working order.

He also dealt with various types of engines which either use fuel more economically or are more reliable in service than our present type of automobile engine. The

engines discussed included the Brayton, the Diesel, the steam turbine, the gas turbine and the Junkers engine, and in the concluding portion of the paper some reference was made to work done by German scientists on processes for the direct transformation of the chemical potential energy of fuel into electrical energy.

One of the points dealt with in the paper was the temperature of the mixture required in order to keep fuels of various end points in suspension, and Prof. Norman showed that this temperature was much below the end point temperature of the fuel. This was a point regarding which many engineers held erroneous views. To demonstrate his point Prof. Norman said that we all knew that the boiling point of water was 212 deg. F., yet, although the temperature in the room was only about 70 deg. F., there was no question that the air in the room contained a large quantity of water vapor. This was due to the fact that the partial pressure of the water vapor was only a small fraction of the atmospheric pressure. The question had been raised as to whether it was better to feed liquid fuel in an only partly vaporized state into the working cylinder and depend upon the heat of compression for completing the vaporization. While it had been shown that in block tests a greater power output could be obtained from a wet mixture, on account of the higher volumetric efficiency that goes together with such a mixture, yet he favored the dry mixture, because of the more nearly complete combustion and the freedom from carbon deposits.

Experiments with Brayton Engine

O. H. Ensign, of Los Angeles, said he had done some development work on a modified Brayton engine. The improvements made had the object of preventing backfiring, and this had been accomplished by feeding the fuel and air separately. Up to the present a sufficient number of hours had been run to permit of the statement that satisfactory results could be achieved. Occasionally there was a slight explosion at the beginning of the power stroke, but this was not injurious. A Corliss type of valve was employed. The chief advantages of the engine were that it started at full torque and could be reversed while running at full speed.

W. A. Fredericks, engineer of the Continental Motors Corp., said that inasmuch as contributions on the subject of burning present-day fuels in present-day engines had been called for, he wanted to point out one of the chief causes of trouble. This was incorrect adjustment of the tappets, so that after the engine had heated up one of the valves failed to seat. This would often cause that cylinder to miss explosions, and as the cylinder would continue to draw in mixture, the fuel would condense, cut the lubricating film on the cylinder wall and cause dilution of the crankcase oil supply.

In this connection Horning pointed out that if it happened to be an exhaust valve there was another very harmful result in that, even though the valve might be of tungsten steel, the seat portion would very quickly cut out, provided of course the cylinder continued to explode. Frederick's point was that this mal-adjustment was not only the cause of disconcerting trouble with the engine but also of serious fuel loss.

G. W. Smith, engineer of the Nash Motors Corporation, said that we were very much in the same position as the children of Israel in the desert. It would be remembered that they sent a mission across the river to investigate the land beyond, and that these missionaries brought home a very glowing account of what they had seen. There was therefore a movement to get into the Promised Land at once. Nevertheless the entry was postponed and it later turned out that this had been a most

O. H. ENSIGN,
Pacific Coast Carbureter Man

PROF. C. A. NORMAN,
Ohio State University

fortunate decision, for if they had entered the land at that time they would most likely have been woefully whipped by the inhabitants.

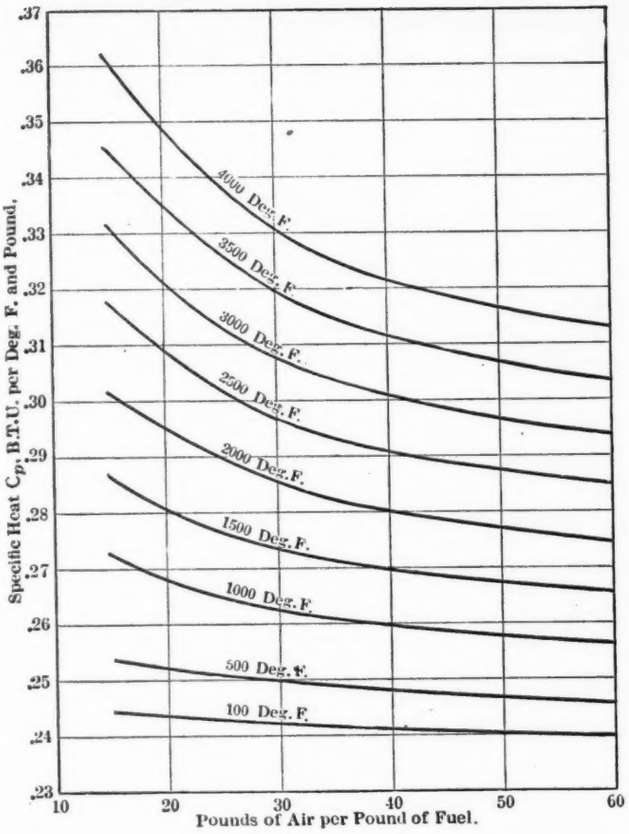
Similarly, while the engines described by Prof. Norman might prove advantageous to the automotive industry at some future date, it would be nothing short of a calamity if we should try to force their introduction into automotive practice at the present time.

M. C. Horine made the observation that one of the greatest causes of crankcase dilution was the use of the engine as a brake. Many drivers had an entirely wrong conception of the proper use of the brakes on a car. The hand brake was generally used for emergencies and the foot brake for regular service, but the hand brake was a poor device for emergency use, as it could not be operated with sufficient promptness. He urged that the hand brake be made the service brake and the foot brake the emergency brake.

The most important points covered by Prof. Norman follow:

An investigation by the United States Department of Agriculture reveals the fact that 68 per cent of all tractor engine troubles occur in magnetos, spark-plugs and carbureters, or in the accessories of the present-day automotive engine. Bearings, cylinders and piston rings, valves and springs, lubrication and starting systems—that is to say, the parts common to all classes of combustion engines—give rise to only 32 per cent of the troubles. From the point of view of reliability alone we have then a most serious reason to be on the lookout for some new type of automotive engine.

The reason from the point of view of fuel utilization is even more compelling. An engine may be considered as



having good carburetion that turns into shaft power more than one-fifth of the fuel energy supplied it. Four-fifths are regularly wasted in our automotive engines. Yet, the fuel must be a peculiarly high-grade one, a liquid meeting severe requirements of volatility, liquidity, etc. The question of continued supply of such a fuel is becoming a serious one. But there are weighty considerations beyond this. In an airplane fuel has to be carried by engine power.

In all aeronautical craft high fuel consumption means a serious reduction in cruising radius. In ocean-going cargo vessels it means a reduction in available revenue space. From purely practical points of view the question of fuel economy, no less than the question of the nature of the fuel, is a momentous one.

One of the first engines to operate with a compressor was that of Brayton. A charge of gas and air is drawn into the compressor cylinder, compressed and discharged into a receiver. From there a small amount passes continuously into the working cylinder through the grating and is kept burning. At the beginning of the working stroke the admission valve opens and a full charge passes into the working cylinder, igniting as it passes through the flame. The grating prevents the flame from striking back into the receiver. The compressor can be driven from a common crankshaft or a beam.

Gas and petroleum engines of this type were developed with great energy by Brayton. Two of them were used some time in the seventies to operate a pair of boats on the Hudson River. Yet the grating and other parts gave mechanical trouble. More serious was the fact that the fuel economy was extremely poor. Only 6 per cent of the fuel energy was turned into power. The energy utilization of the Otto explosion engines appearing simultaneously was twice as high. For further progress it becomes necessary for us to look into the nature of energy utilization.

It is commonly known that a pound of fuel can produce a perfectly definite amount of heat or of work on combustion. Engineers mostly assume that the amount of heat and the amount of work are identical and are given by the so-called heating value of the fuel. This heating value is determined by burning the fuel in a bomb calorimeter, either with oxygen or with a substance containing oxygen like chlorate of potassium. As a matter of fact, the heating value and the maximum work doing capacity are identical only at a temperature of absolute zero. At any other temperature the maximum work doing capacity may be either greater or less than the heating value. At ordinary atmospheric temperature of about 70 deg. Fahr. the conditions are given in Table 1.

TABLE 1. HEATING VALUE AND WORK DOING CAPACITY AT APPROXIMATELY 70 DEG. FAHR.

Fuel	Ratio Work Capacity to Heating Value	B.t.u. per lb.	Work Capacity, hp.-hr. per lb.
Hydrogen burned to water...	0.94	48,700	19.20
Carbon monoxide to dioxide..	0.98	4,300	1.70
Carbon to carbon dioxide....	1.00	14,700	5.80
Carbon to carbon monoxide..	1.21	5,390	2.12
Hexane to carbon dioxide and water	1.03	21,400	8.40
Alcohol to carbon dioxide and water	1.03	13,800	5.30

That carbon burned to carbon monoxide can by extracting work energy from the atmosphere do 21 per cent more work than that furnished by its heat value, is a fact somewhat too interesting to leave entirely unnoticed.

Compressor engines as well as compressor turbines *have* run. Such an engine, aside from the Brayton design, is that of Kraus. The Armengaude-Lemale turbine was successful enough to lead to the formation of a gas turbine corporation in France.

The gas turbines of this company, while they are not used commercially for power production on account of inefficiencies, have been installed regularly to run French torpedoes in connection with stored compressed air. The weight of these turbines is very low, only 1.3 lb. per hp. High temperatures were found necessary to get a good energy utilization. These are serious in a turbine on account of difficulty of cooling the revolving disks and buckets; in a reciprocating engine, on account of the necessity of passing the hot gases through admission valves. However, bucketless turbines may be thought of. One solution, however, which has often been proposed, that of water injection in the combustion chamber, is fundamentally wrong from the standpoint of energy utilization.

A chart showing the conditions obtaining in this respect is reproduced. This is figured for an actual hydrocarbon fuel, burning with air, not for theoretical conditions. An isothermal compressor efficiency of 0.75 per cent has been assumed. Water injection may reduce cooling losses to some extent and shift the expander efficiency from a lower curve to a higher. On these conditions, determinable only by experiment, I cannot here enter.

For those who wish to carry out calculations of this kind there are given a set of specific heat values and $C_p \div C_v$ values applicable to the combustion gases from gasoline or kerosene, also crude oil, with varying amounts of air. The curves are based on the most recent determinations by Nernst and others.

Combustion in Confined Spaces

The explosive process as introduced by Otto can be operated either by the compression of the mixture and ignition by special ignition devices, as in all our usual

automotive engines; or by the compression of the air alone and the injection of the fuel at the end of the compression stroke as is done in the hot-spot, the Hvid and the Brons engines. In the last two mentioned, which are really the same, the ignition is by the heat of compression only. In all these engines only part of the maximum pressure is secured by mechanical compression, the remainder is obtained by temperature increase due to combustion.

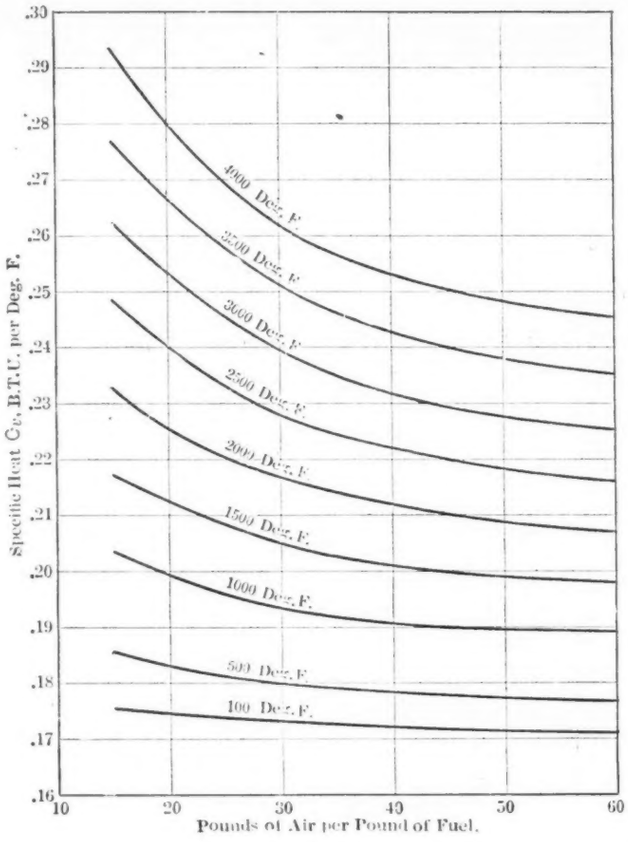
This renders the process less sensitive than that of the compressor engine to inefficiencies of compression. On the other hand, since the expansion ratio in an ordinary reciprocating engine can never be greater than the compression ratio, it is manifest that the expansion can never be carried to atmospheric pressure. A great deal of energy is left in the gases in the form of heat. This heat, as stated, cannot be applied advantageously to the working mixture in the same engine. Theoretically, therefore, the working process is less economical than that of the compressor engine with a heat interchanger.

Actually, Diesel engines with compressions as high as 550 lb. have on the test stand reached utilizations of over 36 per cent. In these engines, as shown by the diagram, fuel injection by air is arranged so as to maintain a practically constant pressure for a short time interval. From the efficiency point of view this is a drawback. It means that the expansion ratio is less than the compression ratio. At full load or overload the pressure is sustained longer than at reduced load. Hence it is found that Diesel engines at reduced load often give better fuel economies than at full load. This is true until the diagram becomes so "lean" and the expansion work of the gases per stroke so small that it is consumed entirely in the mechanical running losses of the engine.

Piston Engines

The gain in efficiency due to increased expansion was clearly realized by early gas engine inventors. Charon, Atkinson, McGhee-Burt and others evolved means for obtaining expansion ratios in excess of the compression ratio. Charon on the impression stroke simply rejected part of the charge into the suction line. With a compression giving a mean *indicated* pressure of only some 43 lb. he attained a thermal efficiency of from 26 to 27 per cent. Similar economies were attained by McGhee-Burt in spite of low mechanical efficiency due to double pistons in two cylinders. Also, Atkinson attained creditable results with his "differential" and "cycle" engines in spite of great mechanical complexity and consequently low mechanical efficiency.

One point on which there is much misunderstanding among practical men is the question of air heating. Hot air means high end temperature of compression. The maximum temperature producible does, however, not vary very much. The ratio of maximum pressure to compression pressure is the same as the ratio of maximum temperature to compression temperature. Hence, with a higher compression temperature we get a lower maximum pressure. The power of the engine goes down. The compression work is a greater percentage of the expansion work and inefficiencies of compression are felt more in the efficiency of the engine. However, if by increasing the temperature of the air we can get a more perfect carburetion and combustion, this as a rule more than offsets the greater influence of compression inefficiencies. Perfect carburetion of present-day kerosene, according to my investigations as published in AUTOMOTIVE INDUSTRIES, Feb. 27, 1919, requires a mixture temperature of about 220 deg. Fahr. and an air temperature before mixing of about 300 deg. Fahr. The temperatures for gasoline, if anybody can say what gasoline is, may be 100 deg. Fahr. for the mixture and 160 deg. for the air.



Injection Engines

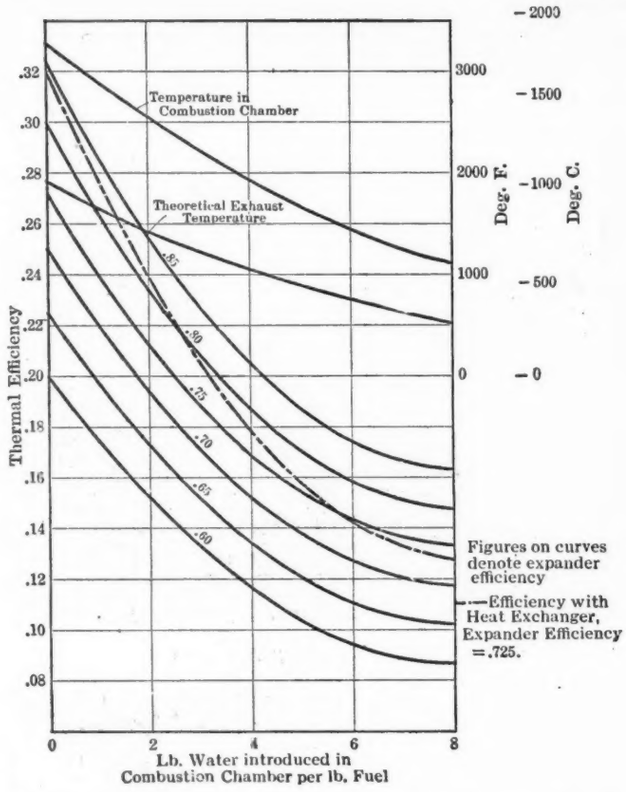
A great deal of very energetic work is at present being done in the United States on various forms of injection engines. The most startling development in this field is, however, the adaptation of the German Junkers engine to aeronautical purposes. This is a two-cycle engine using two pistons working in opposite directions in the same cylinder and uncovering two sets of ports at the end of the stroke. Scavenging air enters through one set and sweeps the combustion products out through the other. The engine is consequently valveless except for the injection valve.

With injection without high-compression air the exact shape of the valve to produce a good spray is a matter of tedious and painstaking experimentation. Complete combustion of a fuel injected in liquid state at high speed is difficult to secure. With injection air a multi-stage air compressor is necessary. Means of obviating this has been proposed by Higgins, although at the expense of delayed ignition.

Explosion Turbines

Explosion turbines are not inherently inefficient due to inadequate expansion does not inherently obtain. The mixture is drawn into an explosion chamber and exploded, whereupon the gases expand through a nozzle and impinge upon a turbine wheel.

Then Holzworth wrote a beautiful book, in which he developed his theories mathematically. In response to this the grand old man of turbine theory, Stodola, proved that while Holzwarth's formulas were all right individually, they were all wrong when put together, and that in consequence his turbine would never meet expectations.



A thermal efficiency of 13 to 15 per cent was all that could be expected of it.

Many inventors have tried to dispense with compression in gas turbines entirely. Even Holzwarth proposes the use of an exhauster to draw gas into his combustion chambers. He actually did use a low-pressure compressor. This exhauster, or compressor, he intended to drive by steam raised on the exhaust of the turbine. As a matter of fact it is not altogether impossible that efficiencies of around 20 per cent may be thus obtained. However, as an explosion turbine is, if anything, a more complex machine than a reciprocating engine, only very unusual fuel economies could justify its adoption.

The higher the steam temperature the greater and the better the thermal efficiency. Ferranti in England has run a high superheat condensing steam turbine at a thermal efficiency of 24 per cent, disregarding boiler losses. We have boiler systems in which these losses amount to less than 10 per cent. This is the case with the surface combustion boiler of Professor Bone, combined with an economizer. By careful application of the counterflow principle so as to absorb all possible fuel heat in feed water heating, the heat losses in any boiler can be reduced below 20 per cent. All told, there should be little difficulty in developing a steam plant for automotive uses which would give as good an energy utilization as the ordinary explosion engine, but do it on almost any kind of fuel.

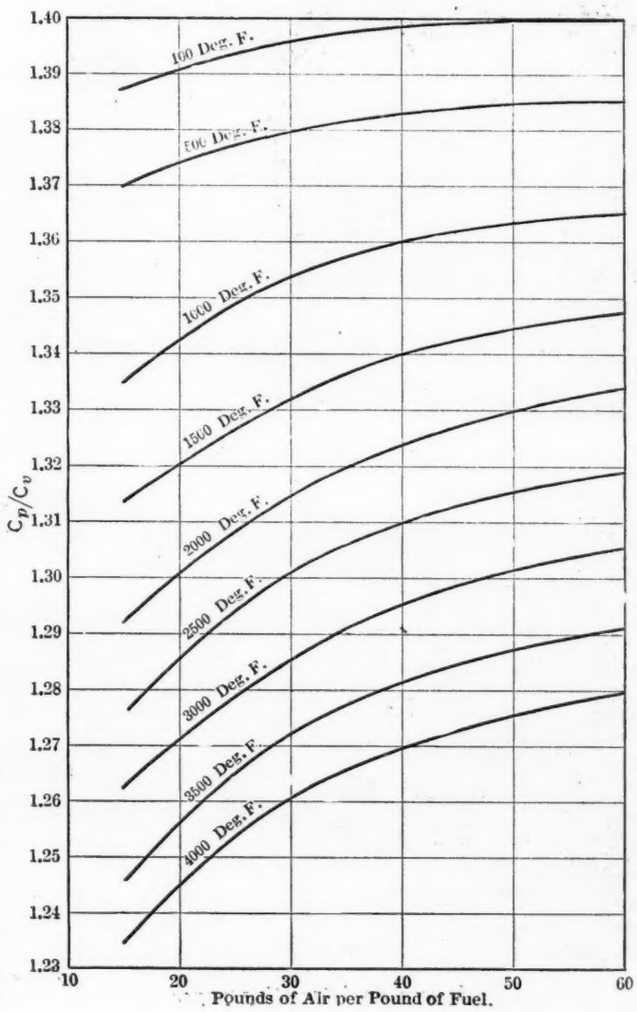
This, in my opinion, is the most immediate duty especially of the tractor and truck engineer. With half the energy spent on boilers that we have been spending on carbureters we should probably have had an excellent safe and reliable high-pressure, high-superheat boiler long ago. The next problem will then be to adapt it to the cheapest kinds of fuel. A non-condensing automotive steam plant can never be made to secure the efficiency that we obtain now with our best airplane engines, still less the economies we hope to obtain with improved apparatus later on. On the other hand, we can never hope to inject solid or gritty fuel, hardly even very low-grade liquid fuels into our automotive internal-combustion engines. These fuels should be handed over to steam plants.

I shall deal here with possibilities of a character entirely different from our present methods of power production, possibilities at present existing as scientific possibilities only, yet perhaps no less definitely established and understood than the principles of wireless telegraphy were established 25 years ago.

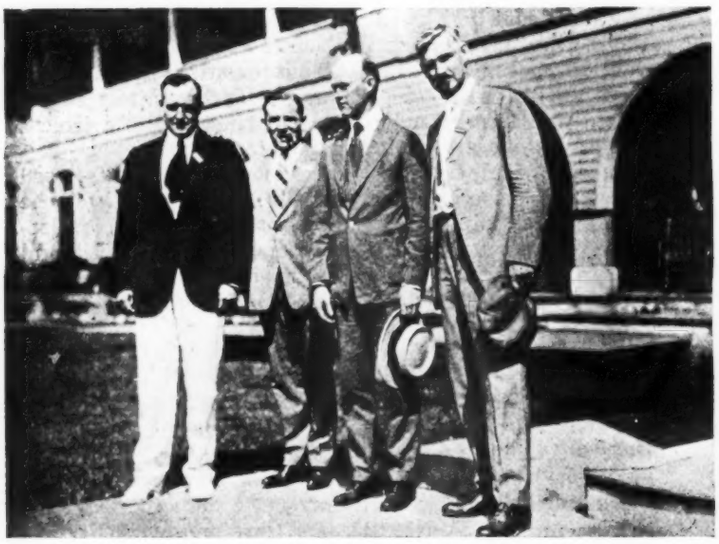
In electrical batteries the chemical force is used directly to drive electricity into a solution and from the solution out into an electrode again. From this electrode it may be carried into an external circuit and there be used for instance to drive a motor. The percentage of the chemical force that is delivered to the motor is dependent only on the resistances in the battery and in the circuit. These resistances can be kept quite low.

The question now arises: Would it be possible to use the combustion process with our ordinary fuels to deliver electric current in a primary battery, and what would be the fuel utilization of such a battery?

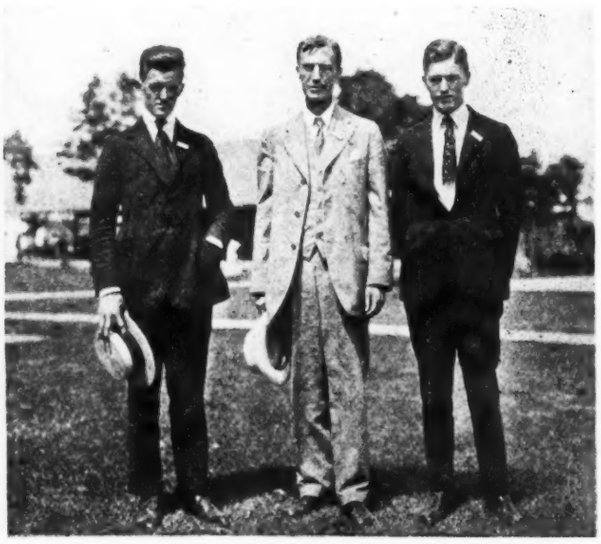
Answering this, we can only state here that as long ago as in 1910 and 1912 some German scientists, notably Baur, Taitelbaum and Ehrenberg, had succeeded in combining such fuel batteries, using fuels ranging from hydrogen to sawdust. Electromotive forces close to the theoretically possible ones were obtained. Burning carbon electrodes, Baur obtained considerable currents without reduction of electromotive force.



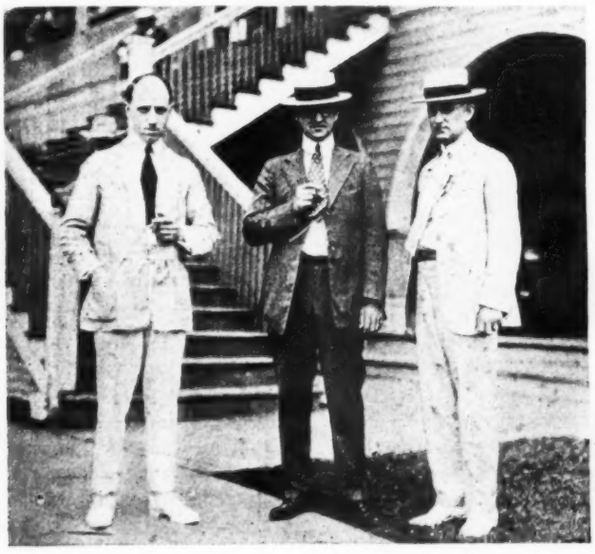
Photographed as They Formed Mutual Interest Groups



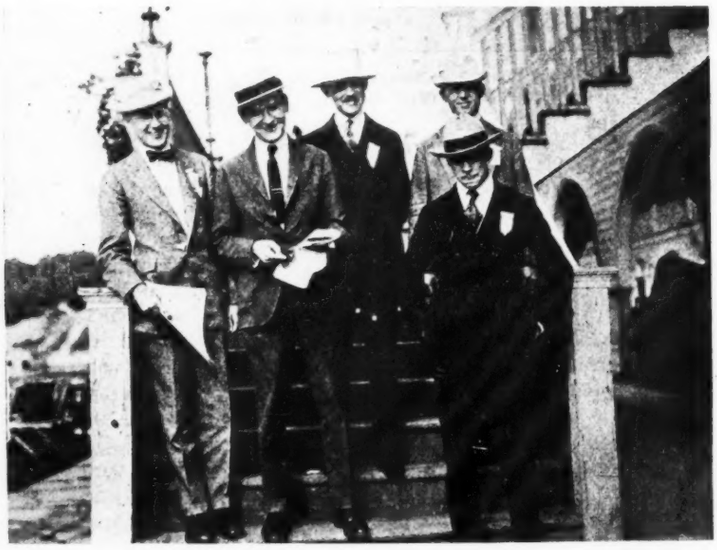
J. B. McWilliams, J. A. Anglada, R. J. Nightingale, Robert Jardine



F. W. Gurney and sons

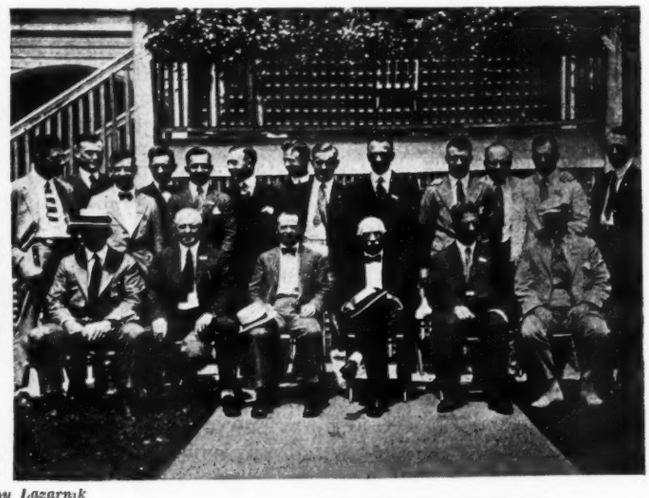


H. E. Rice, C. C. Carlton, H. H Knepper



H. G. Trump, H. T. Ewald, W. E. Bange, B. B. Barnes, J. J. Buzzell

It was an interesting paper



Photos by Lazarnik

Representatives of the Class Journal Co.

S. A. E. SUMMER MEETING

Increased Speed the Need of the Future Tractor

S. A. E. MEMBERS thoroughly enjoyed the instructive debate at the Summer meeting between Professors White and Mowry which involves questions of acute interest to all persons interested in the tractor of the days to come. Professor White held that the first step was to redesign the plow to work at a higher speed.

OTTAWA BEACH, MICH., June 27.

WHILE present plow bottoms are designed to operate at speeds of not over 2½ m.p.h., Prof. E. A. White, of the Department of Farm Mechanics, University of Illinois, believes that plows can be designed to operate at much higher speeds, and that the time has arrived when development along this line should be started.

Professor White, in this comment on tractor plowing speeds made at the annual summer meeting of the Society of Automotive Engineers, touched upon one of the most discussed problems in connection with tractor operation. He is an exponent of higher plowing speeds, and, in general, the 200 S. A. E. members present agreed with him. Professor White believes that the foundation exists today for the development of higher plowing speeds. Engineers should apply well-known mechanical principles in the design of the plow bottom. Fundamentally this problem is one of reducing the vertical component of force which tends to throw the furrow slice over the back of the moldboard.

Obviously, a maximum speed suitable for agricultural operations will be found in time. It is entirely possible that this process will find a most desirable speed for various tractor operations. Taking account of these possible developments, it becomes a question of economic balance between size of outfit and speed. For example, if a two-plow outfit going 3 miles per hr. can be built and operated more economically than a three-plow outfit going 2 miles per hr., the former outfit will be more desirable, provided this same tractor can be adapted to other requirements as well as the three-plow tractor.

As the plow is the most important implement operated by the tractor, Professor White believes that it must receive first consideration in the problem of adapting the tractor to the implement. The function of the tractor is to operate the implement. It is therefore evident, according to Professor White, that no matter what changes may be made in present implements that in the last analysis it is a question of adapting the tractor to the implement. On this point he said:

PROF. E. A. WHITE,
University of Illinois

"It is safe to say that by far the greater majority of our tractors are purchased primarily for plowing. Of course, other types of work are considered, but plowing is usually uppermost in the purchaser's mind. Plowing is the foundation work for crop production. It requires more power than any other farm operation. These facts make it necessary to do work of high quality with a minimum expenditure of energy.

"At the present time there are two schools of tractor design for the two and three-plow outfits. On the one hand we have those tractors which run entirely on the unplowed ground, showing a design embodying a relatively narrow base with a low hitch and causing side draft either on the plow or the tractor, or both. In this case the effects of side draft can be overcome in a measure by increasing the distance between the plow and the tractor, but this will not eliminate the loss in efficiency caused by the couple which tends to twist either the plow or the tractor. This makes it necessary to operate either the implement or the tractor at a disadvantage. The advantages of this system are that the tractor operates on a level surface and the width of wheel face is not limited by the width of furrow cut.

"The other well-known system embodies a relatively wide wheel base with one of the drive wheels running in the furrow, which, with proper design, entirely eliminates the couple commonly called side draft, enabling one to operate the plow under almost ideal conditions. The chief objections raised to this system are that the tractor must operate with one side lower than the other unless mechanical complications for leveling are installed, and

the width of wheel face is limited by the width of furrow cut.

"After a careful study of the problem, I am convinced that the latter system is generally superior, as it gives increased efficiency, less trouble and better general satisfaction to the user.

"To insure that the resultant of the forces tending to move the plow falls in the line of motion of the resultant of the forces resisting the moving of the plow, is a safe principle to follow in designing. In this connection a set of carefully planned and executed field tests should be conducted to determine the loss in efficiency caused by side draft as well as the proper vertical angle of hitch for various conditions. This work would furnish fundamental information to serve as a guide in designing drawbars and hitches, besides putting a permanent stop to the many absurd claims so frequently made for patented hitches, which seldom give satisfactory results in field use. Tests of this nature would give the tractor industry a much desired standing and encourage confidence on the part of the users, who in the last analysis are the judge and jury before which this case must be tried."

PROF. J. L. MOWRY,
University of Minnesota

Prof. J. L. Mowry, of the University of Minnesota, took issue with Professor White on the proposition of running either one or two of the tractor wheels in the furrow. It had also been proposed that the wheels on the plow could be eliminated and the front end of the plow directly connected to the tractor. In his part of the country, *i.e.*, Minnesota and the Dakotas, belt work constitutes from 15 to 50 per cent of the whole work of the tractor, and for this reason the belt pulley must be placed in a convenient position. The job of designing a farm tractor is pre-eminently one for the engineer, nevertheless the designer should have the farmer's or the implement man's point of view.

When Professor White expressed the opinion that the tractor and implement should be so harmonized that one man could drive the outfit and make operation adjustments while the machine was in motion, Professor Mowry again took issue, declaring that a real one-man outfit was a rather idealistic proposition.

According to Professor White, "it is very necessary that the operator be given every chance possible to center his attention on the work to be accomplished rather than the operation of the tractor. It must never be forgotten that the work is the important thing. The tractor can never be considered as reasonably perfect until it is designed so that the operator feels free to devote his chief attention to the implement. This does not apply, of course, to belt-driven machines."

Both Professors White and Mowry agreed in that better tractors are required, and as these two college professors practically monopolized the tractor session there was no opportunity for an expression of opinion from manufacturers. Professor White believes there are four definite lines of tractor development worthy of immediate consideration. These are:

Improving the quality of materials used in tractors and implements.

Increasing the mechanical efficiency of tractors and implements.

Increasing the rate of doing work either by more speed or larger outfits.

Combining the various units in such a manner as to make them more convenient for one man to operate.

Standardization has not been specifically mentioned in the above list for the reason that, except as applied to certain details, too much development in this direction at the present time might easily prove to be a detriment as regards ultimate developments. The tractor has not been in the field for a sufficient length of time to warrant general standardization.

The rapid depreciation of the present tractors and tractor implements leaves little room for argument regarding the necessity for improving the quality of materials used in construction. Of course, poor operation, inferior design and lack of co-ordination between tractor and implement are also responsible for a large part of this rapid depreciation. However, these faults should not be allowed to obscure the fact that there is a need in many instances for improvement in the quality of materials which with accurate workmanship furnishes the very foundation stone for future developments. Every other possible improvement must be discounted unless the quality of material and workmanship are such as to insure a reasonable length of life with freedom from breakdowns. Of course, there is an economic limit to which this development may safely be carried out, but in the light of past experience it is safe to say that this limit is not reached today.

"The advent of the tractor is gradually bringing the question of mechanical efficiency to the front. The pioneer work in any development is a struggle to produce something which will work. Efficiency is a secondary consideration. With the tractor now definitely passing out of this pioneer stage, it is logical to expect that one of the next steps is to strive for greater mechanical efficiency. We can do more work with a smaller expenditure of energy by increasing the efficiency of transmission, increasing the tractive effort per unit weight and harmonizing the design of tractors and implements.

"Increasing the size of the the power unit has invariably resulted in increasing the rate of doing work either by increasing the speed of the operation or increasing the size of the machine used. Both of these tendencies are noticeable in the tractor industry at the present time. The limits to which each may ultimately go can be determined only after extensive field trials with machines designed to operate at a rate of speed greatly in excess of our horse-drawn implements. Obviously, a maximum speed suitable to agricultural operations will be found in time, and it is entirely possible that this process will find the most desirable speed for various operations. Taking account of these possible developments, it becomes a question of economic balance between size of outfit and speed. For example, if a two-plow outfit going 3 miles per hr. can be built and operated more economically than a three-plow outfit going 2 miles per hr., the former outfit will be more desirable, provided this same tractor can be adapted to other requirements."

The two professors again locked horns on the question of types of plows. Professor White when he expressed the opinion that the weight of the front end of the plow should be carried on the rear of the tractor, thereby increasing the tractive efficiency of the tractor, brought Professor Mowry to his feet with the retort that such a construction was opposed to good plowing in that it did not permit the plow to float in the soil as it is supposed to do when operating to the best advantage.

Professor Mowry agreed with Professor White in that separate types of tractors would be produced for heavy work on the farm. There would be one type for plowing, disking, etc., and a lighter type for cultivating corn and other rowed crops.

Professor Mowry said that the farmer really wanted good implements and was prepared to pay the price. He was opposed to the present standard plowing speed of the S. A. E., which was entirely too low, and was of the opinion that plowing speeds would be raised to 3 and perhaps 3½ m.p.h.

As regards the sizes of tractors most suitable for the average farm, he thought that there was no place for the two-plow outfit and that we would see its disappearance in a few years. It would be replaced by three and four-plow tractors, and mainly by the size now rated as a four-plow tractor, but which in the future might be called a three-plow.

Development of Farm Implements

According to Professor White a strong development movement is proceeding in the farm implement field. Here is his summary:

"The developments in regard to the disk harrow and seeding machinery seem to be proceeding satisfactorily, especially for use in connection with the smaller tractors. It is to be hoped that the hitches for use with larger combinations can be simplified in order to make them more convenient from the user's standpoint. There is a real need for experimental work upon the disk harrow for the purpose of determining the relation between form and diameter of disk, weight per unit of width, angle of cut and quality of work. It is only through tests of this nature that we can be certain of improving the efficiency of this great soil preparation machine.

"Harvesting machinery needs to be improved in such a manner that the rate of cutting can be increased without causing such rapid depreciation as occurs to-day. This means better material, refinement in design, stronger frames and a decided improvement in the bearings. The next step is to find the maximum width of cut which can be handled by one knotter head. Present practice indicates that this may be 12 ft., although it is possible that the time required for placing the band and tying the knot may be reduced by introducing mechanical refinements, allowing a still wider swath to be handled. There is still room for far-reaching improvements in the line of making the tractor and binder a one-man unit. Extension controls now in general use are, at the best, makeshifts. It would appear that a combined unit could be developed, with provision for detaching the binder from the tractor. By this means the machinery would be driven directly from the engine instead of from a bull wheel running on the ground. This would be a genuine one-man outfit. Changes in this direction will, of course, increase the difficulties of transferring the tractor from one machine to another. As a rule, the farmer does not like complications of this nature, but if compensating advantages can be obtained the change will be welcomed.

"The problem of adapting the tractor to all kinds of belt-driven machinery is relatively simple. It is primarily a question of standardization to reduce the number of pulleys required and establish belt speeds which will give maximum efficiency."

THE ballot for the election of new members of the Council of the Institution of Automobile Engineers resulted in the election of the following members: A. E. Berriman, Sir Dugald Clerk, Colonel Crompton, L. H. Hounsfield, Col. J. S. Napier, Hy. Brearley, A. E. L. Chorlton, J. H. Dickenson, L. A. Legros, Dr. W. R. Ormandy, S. Straker, Lt.-Col. Briggs, L. Cotalen, Dr. Hele-Shaw, T. Blackwood Murray, and T. C. Pullinger.

Snapshots On and Near the Sports Field at Ottawa Beach

C. L. SCOTT
Sprague Electric Works

FRANK BRISCOE
Jackson Carbureter Co.

R. H. JOHNSTON
of White Co.

D. L. GALLUP
Nordyke & Marmon Co.

A. P. BRUSH
Brush Engineering Assn.

S. A. E. SUMMER MEETING

Is Rust-Proofing for Trucks Practical?

QUESTION raised at the S. A. E. Summer meeting and the discussion shows that engineers are not unanimous as to merits of the various rust-proofing processes—The chief objection advanced was that the treatment was likely to change dimension of fits, but this was challenged.

OTTAWA BEACH, MICH., June 27.

IS it practical to make exposed metal parts of trucks and other utility vehicles rustless?

The question was raised at the S. A. E. Summer Meeting in a paper by E. T. Birdsall, a consulting engineer, who introduced his subject by calling attention to the great waste due to rust of exposed parts and accepting the theory that rust is caused by the electrolytic action between the various constituents of iron and steel in the presence of moisture and impurities. This is a continuous process, he said.

There was a pointed and informative written discussion on this paper. Only one of the discussers took issue with the theory of rust, but several of them disputed the merits presented for the various processes. The chief objection to the processes changed the fits.

Birdsall said that paints and applied coatings only protect metal when they are air-proof, and then he presented these rust-proofing processes:

Cold Processes

Oiling and greasing.
Painting or dipping.
Copper, nickel, brass and zinc plating.
Spraying with molten metal (Schoop process).

Hot Processes

Japanning or enameling (300 to 500 deg. Fahr.).
Coslettizing (212 deg. Fahr.).
Parkerizing (212 deg. Fahr.).
Guerini (212 deg. Fahr.)

High-Temperature Processes

Hot galvanizing (850 deg. Fahr.). Dipping in molten zinc.

Tinning (500 to 550 deg. Fahr.). Dipping in molten tin.

Lead coating (700 deg. Fahr.). Dipping in molten lead, or lead and tin (terne).

Lohman process (640 deg. Fahr.). Dipping in molten alloy of lead, tin and antimony.

Bower-Barff (1500 deg. Fahr.). Black oxide formed by exposure to steam and hydrocarbon gases.

Sherardizing (950 deg. Fahr.). Exposure to zinc dust in retorts.

Gesner process (1299 deg. Fahr.). Modification of Bower-Barff.

Bontempi (1000 deg. Fahr.). Uses various fumes, such as oil gas, zinc, etc., in retort, resulting in the formation of a black oxide.

Enameling, vitreous (1500 deg. Fahr). Powdered glass is sprinkled on and melted in a muffle.

The principal requirements of a rust-prevention process, as applied to automobiles, aircraft, and other machined and hardened parts, are:

(1) Prevent rusting under normal use.
(2) Not allow the rust on an abraded spot to spread.
(3) Not change the dimensions or fits.
(4) Not alter in the slightest the physical properties.
(5) Be permanent for the life of the article.
(6) Be easy and quick of application.
(7) Be commercially practicable as to cost.

Requirements (3) and (4) at once eliminate the high-temperature processes, while requirements (2), (3) and (5) eliminate the cold processes and also japanning.

Of the remaining three hot processes, Coslettizing and Parkerizing are closely allied. Parkerizing is based on the Coslett process, which was developed in England, but has been vastly improved and rendered commercially practicable by American chemists. The Guerini is a picric acid process, little known outside of Italy, and no data as to its cost, or other characteristics, are available.

Metal platings, with the exception of zinc, do not fill the second or third requirements. Zinc plating, on the other hand, is liable to be porous and the zinc itself will oxidize unless protected by a weather-resisting varnish. All the other plating metals that can be used commercially are electronegative to iron and will flake off if the coating is abraded.

Parkerizing, if thoroughly done according to the latest methods, fills the above requirements better than any other process now in commercial use. As to its permanence, the experience of 3-yr. use seems to indicate that under normal conditions of exposure it is practically permanent. It is well known that polished plated surfaces do not hold paints or varnishes well. A Parkerized surface seems to be particularly well adapted to take paint or varnish which are abraded with great difficulty when dry; and, since it also meets the second requirement almost entirely, there is no danger of flaking even if the surface should be abraded.

It is hardly to be expected that any one process will meet all the varied requirements, as many of them are contradictory, especially as to the character of the finished surface and color. For example, vitreous enameling is much used for kitchen utensils and street signs, but is absolutely unsuited for aircraft or automobile parts. Hot galvanizing and tinning also have applications for which a substitute will be very difficult to find, such as parts that have to be soldered. Processes that are lim-

ited to a black color cannot be used on articles on which this color is objectionable. It would seem, therefore, that until a universally applicable process is discovered the engineer must select from the available processes the one that is best adapted to the job in hand.

The Discussion

In the discussion, W. MacGlashan called attention to the use by the Cadillac Co. of vitreous enamel-coated manifolds, which they had found satisfactory in ordinary driving temperature, but which will not stand high temperature in laboratory tests. He said they had found nothing that was entirely satisfactory. They had tried the Parkerizing, but it had not been successful on cap screws and nuts which were scratched. They had not found Sherardizing a permanent process.

J. C. Hunsaker's experience was that the Parker process would not stand sufficient salt spray tests, but that steel seaplane fittings treated with zinc stood a 100-hr. exposure test.

R. Huff had found the Parker process good for certain requirements, but not all assembly parts. In the Dodge car they had used high baked enameling, tin, electro-zinc plate and lead-coating processes, as well as hot galvanizing, copper and nickel plate and painting methods. They had never used the Parker process.

M. W. Hanks took issue with the electrolytic process of rust. He reported that experiments of the Navy in obtaining adequate protective coatings for metallic fittings led to the use of zinc plating almost exclusively, as it found that this coating, put on either electrolytically or by a hot process, is very satisfactory.

P. W. Abbott took issue on the features of the Parkerizing process, suggesting that Birdsall was the champion of this method. He said that it was not necessary to consider rust-proof processes for most of the parts in which the physical properties are very high, for these parts are running or reciprocating parts, usually exposed to a bath of oil or grease which keeps them from rusting. The parts which one desires to rust-proof are those on the outside of the engine, or parts of the body and accessories which do not require high physical properties, so that high-temperature processes are applicable as far as the temperature goes.

He continued: "The statement that electro-metal platings, with the exception of zinc, do not meet the second or third requirements is open to discussion, as I cannot see why zinc should be put in a class by itself, as electro deposition of zinc would certainly change the dimensions of fits as well as the deposition of nickel or copper, and I cannot see where the zinc would meet this requirement any better than the others. The latter part of this same paragraph states that 'the zinc plating, on the other hand, is liable to be porous.' This is true of any plating if the work is not properly done. Electro-zinc plating I believe to be harder to apply properly than nickel plate, but if applied properly I consider it to be superior to nickel plate as far as protection goes."

He advocated, for automobile parts, nickel plate over a good copper plate. For fender and bulky parts he recommended enamel as the best practical process. He said that in regard to rust preventives in changing dimensions that the proper allowance could be made, for instance: on threads, the practice is to allow 0.002 in. in diameter for copper and nickel-plating parts. These parts seldom have high physical properties which temperature will affect. "As far as permanency goes," he said, "the nearest to permanency that I know comes in the high-temperature processes, as follows:

"Hot galvanizing, tinning, lead coating or terne plating, Sherardizing, vitreous enameling.

"All of the common methods of rust prevention are easy and quick of application; the vitreous enameling being about the most costly and taking the longest time. There are some processes mentioned among this list that I am only familiar with by reading descriptions and articles on them, never having seen them put into actual practice, such as the Schoop process of spraying with molten metal, Coslettizing, Lohmanizing, Guerini, Bower-Barff, Gesner and the Bontempi processes. All of the well-known methods in use are commercially practicable as to cost with the exception of these that I have just quoted, of which I am not familiar with the practical application."

The speaker challenged Birdsall's recommendation to Parkerize, and said that he had never seen any permanent Parkerizing unless that it had been kept oiled or greased, and if kept oiled there would be no use of rust preventing them. He said: "The only use that the Parker process will fill, in my opinion, is as coloring process to use on mechanism that is to be constantly kept in order and wiped off clean with oily rags, etc. It cannot be compared for permanency with any of the plating processes, as it is purely and simply a coloring process."

Birdsall responded that the general trend of discussion appeared to indicate that the speakers were not familiar with the progress made in the Parker process. He continued:

"The statements I made in regard to the Parker process are being substantiated in the Cleveland plant every day on millions of pieces used in a great variety of manufactures. As to exhaust manifolds, they have a second process through which the manifolds are put after the usual Parkerizing, and they seem to stand up in regular use but not on block test. If a Parkerized piece, such as a fender, is enameled, the rust on an abraded portion absolutely will not spread under the enamel and flake off. I have proved this to my complete satisfaction.

"As to the oiling of the Parkerized pieces, this is not done to make them rust-proof, but to neutralize the processing acid remaining in the pores of the metal and the coating. I have seen unoiled pieces that have hung on the side of a building for months without showing rust. As to permanency, it is certainly more permanent than any other process of equal cost. Pieces buried in the ground and exposed on roofs for over a year are still in good condition and also free from oil."

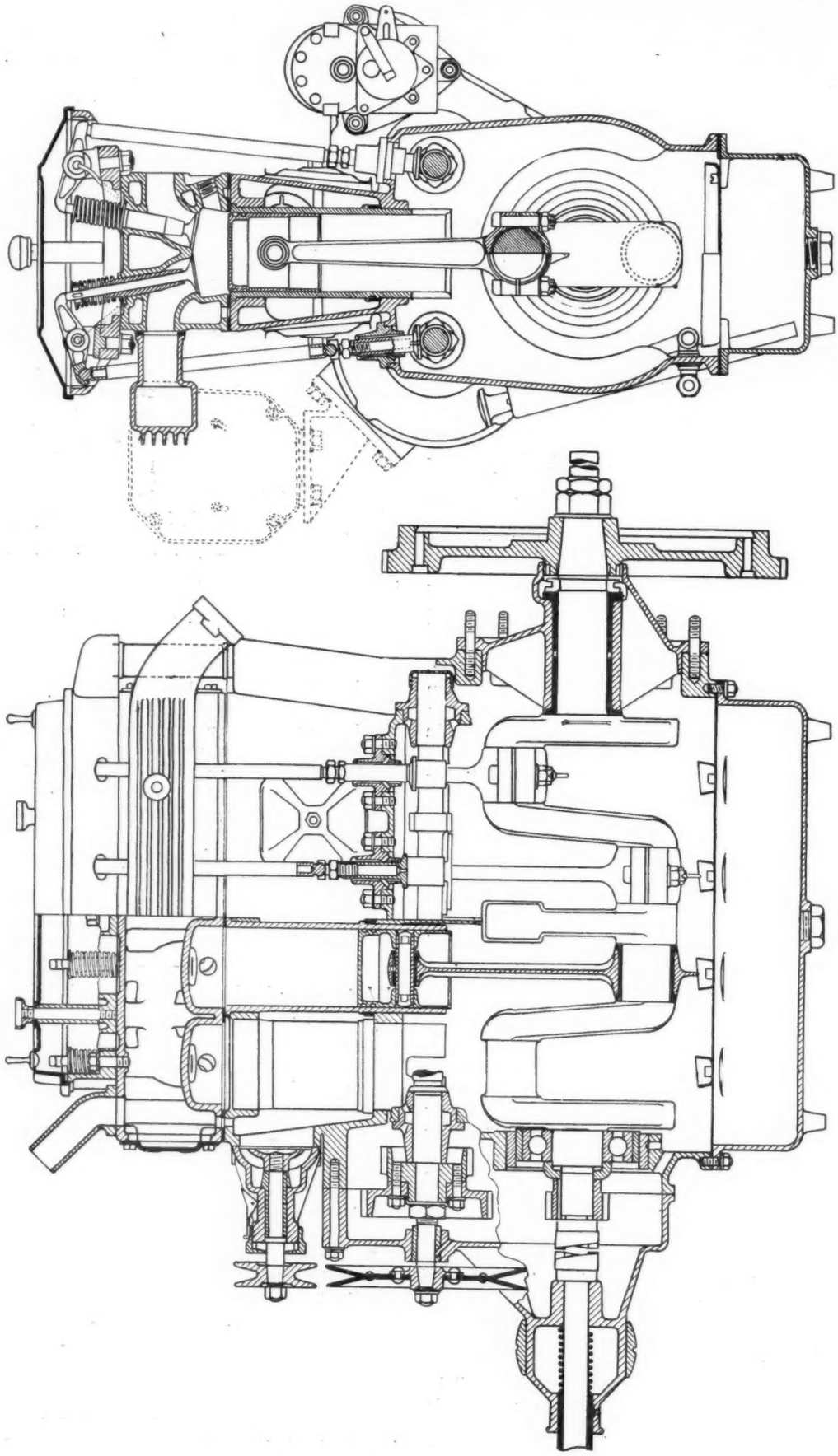
Waterproof Glues in Automobile Manufacture

SOME of the new waterproof glues developed primarily for aircraft purposes during the war offer the possibility of overcoming a difficulty that has proved very annoying, both to the automobile owner and to the manufacturer, wherever linoleum is used on the running board or as a covering for the floor of the car. Ordinary glues which are soluable in water are not very effective in cementing linoleum, and most automobile owners have soon discovered that the glue disintegrates and the linoleum comes loose after the car has been washed a few times.

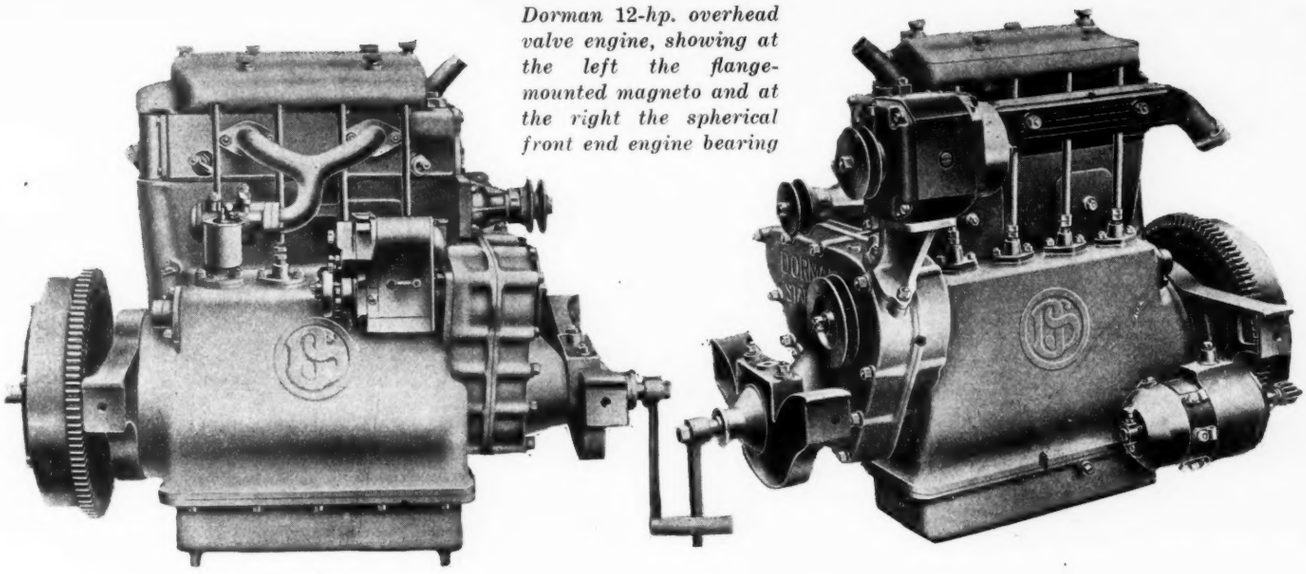
Casein glues are admirably adapted to this purpose, and if the quality is right and they are properly applied the linoleum should give no trouble during the life of the car. Casein glues are exceedingly resistant to the action of the water and retain a very high percentage of their original strength, even after long immersion under water. They are comparatively inexpensive, and the materials are readily available.

Information on casein glues and their application may be obtained from the Forest Products Laboratory of the U. S. Forest Service, at Madison, Wisconsin.

Dorman 12-Hp. Overhead Valve Engine



This engine has an aluminum cylinder block with inserted cast-iron sleeves, a separate cylinder head containing the valve seats, a counter-balanced crankshaft with one plain and one ball bearing, and other features of interest



Dorman 12-hp. overhead valve engine, showing at the left the flange-mounted magneto and at the right the spherical front end engine bearing

An Unconventional British Engine

Aluminum Jackets with Cast-Iron Cylinder Sleeves Inserted—A Leaf from the Book of Aero Engine Practice

THE influence of aircraft engine practice is evident in the cylinder design of an automobile engine that has been put into production by W. H. Dorman & Co., Ltd., Stafford, one of the oldest and largest firms in England making nothing but internal combustion engines for cars and trucks.

This engine forms one of a range of sizes running from 69 x 100 mm. (2¾ x 3 15/16 in.) for light two-seaters to 140 x 180 mm. (5½ x 7⅛ in.) for big trucks, fire engines, etc., all having four cylinders. It is, however, the only model embodying the special system of cylinder construction described hereafter. It has a bore and stroke of 69 x 120 mm. (approximately 2¾ x 4¾ in.). A detachable head carrying overhead valves is mounted on a one-piece aluminum casting which comprises the cylinder jackets and the complete crankcase, with the exception of an oil pan or sump.

The cylinder liners are separate units in cast iron, machined all over and pressed into the jacket casting from above. A flange at the top end of each liner takes a seating in a groove machined in the jacket, and a shoulder near the lower end compresses a rubber ring between it and the lower jacket web. The rubber ring serves as a water seal at this end and also as a flexible joint, allowing for the unequal expansion of the aluminum and cast iron which occurs with appreciable variations in temperature.

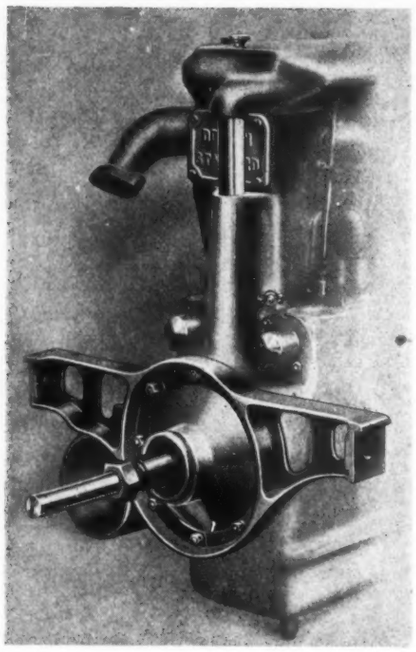
The top water joint between liner and jacket is taken care of by the cylinder head gasket. No trouble has been experienced with the rubber ring joint, as it is submitted to no temperature higher than that of the boiling point of water, being below the end of the travel of the piston crown.

Reduced weight and higher efficiency are advanced in favor of this system of construction, the absence of cylinder distortion at high temperatures being assured by the uniform cooling of the liners, for they are surrounded by water and fashioned without irregularities in shape or section.

In course of assembly the counterweighted crankshaft is threaded through a large circular opening at the rear end of the crankcase, the cover plate of which forms the housing for the long die-cast white-metal bearing of the shaft at that end. At the front a ball-bearing is used. With the shaft in position the cast-iron pistons and the H section drop-forged connecting rods are put into position from below, the rectangular opening at the bottom being large enough for the purpose.

The one-piece aluminum casting forming cylinder jackets and complete crankcase of the 12-hp. Dorman engine

Two camshafts are used, one on each side of the crankcase, driven by a silent type chain. The valves, inclined at a slight angle in head, are operated by disc-ended tappets, tubular push rods and overhead rockers; the overhead gear is set in a tray formed by extending the sides and ends of the head casting, and is enclosed by a pressed steel cover. A large diameter passage leads from the crankcase to the valve chamber, with a coupling pipe between the two, and serves as a breather and to convey some of the "oil mist" in the crankcase upward to lubricate the valve rockers and stems. Small troughs are also



Rear end of the 12-hp. Dorman engine, showing the passage and connecting pipe from crankcase to cylinder head cover to convey "oil mist" to the overhead valve gear

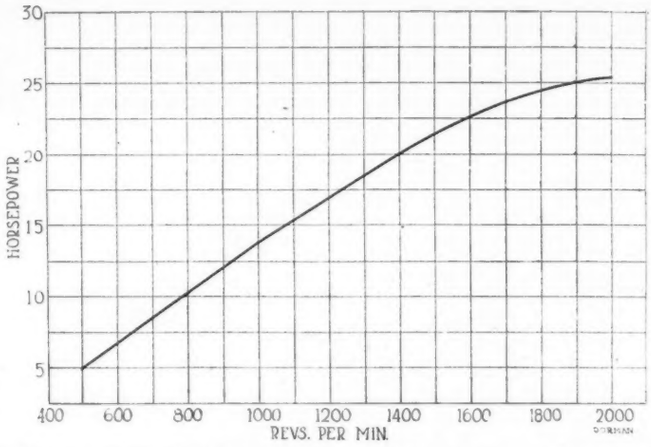
formed in the top of the head with wicks leading from them to the hollow spindles of the rockers.

The water is circulated by an assisted thermo-syphon system, an accelerator or impeller being arranged at the front of the jacket casting in the elbow forming the water lead from the bottom of the radiator. The impeller is at the rear end of a belt-driven shaft, the same V belt serving for the lighting dynamo, which is arranged on a bracket above the left end of the distribution casing.

A trough and splash system of lubrication is used with a gear pump driven from one of the camshafts.

The engine is three-point suspended, a spherical trunnion bearing on the starting crank bracket being housed in a cast steel double-ended bracket, which can be attached either to the main frame or to a subframe. A somewhat similar bracket is bolted to the rear end of the crank case, the studs and nuts that hold the end-plate serving for the purpose.

The magneto is of the flange-mounted type, which is meeting with a good deal of favor in England, being a standard pattern of several magneto makers. Engine



Power curve of 12-hp. Dorman engine taken on Heenan & Froude water dynamometer

manufacturers find it a very convenient type for small engines, as a bracket is eliminated and the machine is supported by a large flange cast in one piece with the end plate of the machine. A flexible coupling in the drive is also dispensed with, the driving gear or sprocket shaft and the armature spindle being serrated and having merely an internally serrated sleeve between them.

The power development of the 12-hp. Dorman engine is shown in the accompanying curve. It runs up to considerably over 2,000 r. p. m., but the summit of its power curve occurs round about that speed. It is the only engine as yet announced and standardized in England with loose cylinder liners in an aluminium jacket, though a high priced car of a new make, the Ensign, is to have an engine with similar cylinder construction but with an overhead camshaft.

As the prospective power unit for light and fast two and four seaters—"sporting" models, as the British motorist knows them—the new Dorman is in great demand among chassis assemblers. Many of the latter, by the way, are being held up for want of rear axles and gearboxes, for the only British component firm that counts is refusing to accept any more orders for delivery this year. But that is another story.

Warping of Aircraft Propellers

ONE of the greatest troubles experienced with airplane propellers during the war was caused by the warping and twisting of the blades near the tips, and a large percentage of the propellers received at the front were rejected on this account.

In order to determine the causes and to develop methods of preventing this trouble, a number of exeprimental propellers were manufactured for the War and Navy Departments by the Forest Products Laboratory of the U. S. Forest Service at Madison, Wis.

The propellers were made of Central American and African mahogany using carefully selected stock uniform in density and moisture content, and were stored under uniform atmospheric conditions for 30 days between the roughing out and final carving operations. After the standard finish, consisting of five coats of spar varnish, had been applied, they were again stored under the same conditions for observation as to warping and twisting.

These propellers were made up and handled much more carefully than the commercial product, and every possible effort was made to produce perfect results. After exposure to a very damp or humid atmosphere for three or four months, it was found that every propeller had warped or twisted or otherwise changed shape to an extent that made them unacceptable for use. They had all absorbed about five per cent of moisture through the five coats of spar varnish, and this moisture caused all the trouble. The treatments to which these propellers were exposed, namely, being manufactured in a relatively dry condition and later exposed to moist atmosphere, is very similar to that which is normally received by propellers made in the United States and shipped to France. Frequently propellers are made in a relatively moist climate and shipped to a drier one, and trouble from change of shape due to drying out is almost sure to result.

There is only one way in which trouble from change of shape due to changes in moisure may be obviated, and that is to prevent these moisture changes. The experiments just outlined show that it is impossible even under ideal manufacturing conditions to produce propellers which will not warp or twist with changes in moisture.

These changes may be prevented either by applying a moisture-proof coating or by keeping the propellers under uniform atmospheric conditions throughout their life. At present, the aluminum leaf coating developed by the Forest Products Laboratory is the only practicable moisture-proof coating which has been successfully applied to propellers. It is not possible to keep propellers under absolutely uniform atmospheric conditions during manufacture and service, but these conditions can be approached by making up the propellers at the moisture content which they will normally reach in service. Propellers coated with aluminum leaf have the best chancce of giving high efficiency and long service.

The FORUM

The Proposed Tractor Rating

AN analysis of the recently proposed S. A. E. tractor rating brings out some facts very interesting to the tractor engineer. This rating of 13,000 cu. in. piston displacement per minute when compared to 33,000 ft.-lb. per minute shows that $\frac{33,000}{13,000} = 2.54$ ft.-lb. of work is expected to be the output of 1 cu. in. of piston displacement. Upon investigation it will be found that the average performance of various engines built in the past show a torque of 6.75 lb.-in. per cubic inch of piston displacement. Now, a torque of 6.75 lb.-in., acting through one revolution is equivalent to $\frac{6.75 \times 2\pi}{12} = 3.53$ ft.-lb. of work.

This average of engine performance is taken with gasoline as fuel, and we may assume that the tractor is going to or is operating on kerosene, with which fuel, experience shows us, a power drop of 18 per cent may be expected. Consequently we will have an average performance of 82 per cent of 3.53 = 2.9 ft.-lb. per cubic inch displacement with kerosene as fuel.

Comparing these two values, 2.54 ft.-lb. per cubic inch excepted in S. A. E. rating and 2.9 ft.-lb. per cubic inch as average engine performance, it is seen that an efficiency loss of $1 - \frac{2.54}{2.9} = 12$ per cent is allowed for between the power plant and the belt pulley. It may be assumed that this 12 per cent loss is accounted for as follows: Of this 8 per cent may be taken as a fair allowance for non-uniformity in engine performance. This still leaves us $1 - \frac{2.54}{2.9 - (0.08 \times 2.9)} = 5$ per cent, which may be considered as absorbed by the one pair of gears through which power to the belt pulley is transmitted in a number of tractor designs.

Again, the new S. A. E. rating calls for a draw-bar horsepower of 50 per cent of the belt rating, so we have $2 \times 13,000$ or 26,000 cu. in. displacement per minute per draw-bar horsepower. Referring back to the accepted average performance of 2.9 ft.-lb. of work per cubic inch of displacement with kerosene as fuel, it will be seen that we have $2.9 \times 26,000 = 75,000$ ft.-lb. output at the engine against 33,000 ft.-lb. output at the draw bar. Deducting 8 per cent again for non-uniformity of engine performance, as was done in the case of the belt rating, we have 92 per cent of 75,000 or 69,400 ft.-lb. against 33,000 at the draw bar, showing a loss of $1 - \frac{33,000}{69,400} = 52.5$ per cent absorbed in the transmission and in overcoming the rolling resistance of the tractor.

Owing to the fact that the rolling resistance of a tractor remains constant, regardless of speed, the power consumed in overcoming that resistance will vary in direct proportion to the speed. From this it will be seen that it is impossible to assign a definite proportion of this 52.5 per cent power loss to overcoming rolling resistance, except at a given speed. An additional reason why a definite relation cannot be made between these two factors—power loss and rolling resistance—is that a very great diversity of practice exists in the relation between tractor power and tractor weight.

In order, however, to analyze this loss and see where it is absorbed, we will take average figures for these two values from several popular tractors on the market. First—the average plowing speed lies very close to 2 miles per hour. Second—the tractor power will be represented by 52 cu. in. displacement per minute per pound of tractor weight.

Assuming a coefficient of rolling resistance of 0.15, we find that $0.15 \times 2 \times 88 = 26.4$ ft.-lb. per minute per pound of tractor weight will be required at 2 miles per hour to overcome rolling resistance. Now, applying the figure 52 cu. in. displacement per minute per pound of tractor weight we will have $\frac{26,000}{52} = 500$ lb. of tractor for each rated draw-bar horsepower, and before delivering one rated draw-bar horsepower we will use $500 \times 26.4 = 13,200$ ft.-lb. per minute in overcoming rolling resistance.

By deducting 33,000 + 13,200 from 69,400 (power plant output) we find that we have 23,200 ft.-lb. per minute which may be absorbed in the transmission and in the wheel bearings. This can be expressed as

$$\frac{23,200}{69,400} = 33.4 \text{ per cent of engine output.}$$

With reasonable design and construction this transmission and wheel bearing loss should not be over 25 per cent., in which case a tractor speed much in excess of 2 m.p.h. could be maintained before the draw-bar horsepower plus losses would balance the engine output.

Assuming this loss as 25 per cent, we will have

$$\frac{(0.75 \times 69,400 - 33,000)}{500 \times 0.15 \times 88} = 2.88 \text{ m.p.h.}$$

This shows that under the conditions as here laid down the tractor could be geared to this speed before the draw bar output would fall below its rating.—MR. SHELDRICK, Engineer, Parrett Tractor Co.

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The accompanying table of data obtained in tests on tractor engines at Columbus, Ohio, shows that the average value of the piston displacement per minute per horsepower is close to 13,000.

Tractor Tests, Columbus, Ohio, 1919—Kerosene

Tractor	Engine		R.P.M.	Belt, H.P.	Displacement		Cu. In. per Minute per H.P.	Remarks on Method of Power Take Off
					Cu. In. per Rev.	Cu. In. per Minute		
Bates-Mule...	Erd,	4-4 x6	929	21.4	301.6	280,000	13,100	Bevel and spur gears
Case 10-18....	Own,	4-3⅞x5	1125	19.8	235.8	265,000	13,400	Direct
Case 15-27....	Own,	4-4½x6	862	27.7	381.7	325,000	11,700	Direct
Elgin 12-25...	Erd,	4-4 x6	940	19.2	301.6	284.000	14,800	Friction
E-B 12-20....	Own,	4-4¾x5	883	24.7	354.4	313,000	12,700	Bevel gears
Frick 12-25...	Erd,	4-4 x6	998	24.5	301.6	301.000	12,300	Direct
Fordson 11-22.	Own,	4-4 x5	1125	21.4	251.3	282,000	13,200	Bevel gears
Huber 12-25...	Waukesha,	4-4½x5¾	1036	28.3	365.8	379,000	13,400	Direct
Hart-Parr.....	Own,	2-6½x7	783	37.5	465.0	364,000	9,700	Direct
Waterloo Boy.	Own,	2-6½x7	733	21.2	465.0	341,000	14,100	Direct
I.H.C.....	Own,	4-5¼x8	575	35.0	692.7	398,000	11,400	Direct

FARM windmills are now equipped with ball bearings. One advantage is better performance of the mill; but a more marked advantage is the elimination of the climb to the top of the mill for oiling. The ball bearings, it is said, run for five years with their original oiling.

S. A. E. Reconstruction Meeting Analyzes Future Problems

(*Continued from page* 5)

but the difficulty lies in the membership largely losing its identity in such a center. There would be the difficulty of holding successful professional meetings and there would not be that esprit de corps development which is possible at a place such as Ottawa Beach.

Army and Navy Day was a supreme success, if the expression may be pardoned as applied to an engineering meeting. Maj. Gen. C. C. Williams, Chief of Ordnance, made a special trip from Washington here to address the meeting and witness the demonstration of tanks and other ordnance apparatus. His motive for attending the meeting was brought out in his address to the membership when he declared that the Ordnance Department wanted to continue the closest co-operation with the engineers in peace as well as they had done in war. Using the example of the excellent work done by H. M. Alden in the Ordnance Department in the design of tanks during the war, he looked for equally close co-operation in the future of the department.

At present there are congress-made laws which practically make it impossible for members of the army or navy to belong to the S. A. E. or any other engineering organization. Deeply regretting this, he looked forward to the time when all ordnance engineers and particularly those in responsible positions would be members of the society. The nature of ordnance development is such that it is imperative that those in charge of the work must work in closest co-operation with the S. A. E. The suggestion was made that perhaps a military division of the society might be one of the solutions of the problem.

Following the forenoon session given over to army and navy work, all of the members and guests took the ferry across the entrance of Black Lake, a 5-minute trip, to witness the demonstration of the Mark VIII tank, and also one of the largest British tanks which had seen service in France. These two, together with a motorized 8-in. howitzer mounted on a creeper construction, demonstrated through cellars of burned-down buildings and afforded an opportunity to the members of seeing exactly how they maneuver over such places, as well as how they push down trees and operate in open ground.

An equally interesting feature of the ordnance exhibit, and one which cost the S. A. E. a good deal to stage, was that of captured German trucks and tractors which were brought to this country under the direction of Lieut. Col. Arthur J. Slade. This exhibit included half a dozen leading makes of German trucks, and two or three of their very large tractors fitted with internal combustion engines. These latter have huge 8 ft. rear wheels, and were used for moving heavy field pieces. They are about a stage larger than our big American traction engines. The exhibit of French guns mounted on automobile types of chassis, fitted with rubber tires, was of unusual interest. These were the types developed by France in the last couple of years and which were manufactured in large quantities in the Renault factory.

Never before in connection with the summer meetings of the S. A. E. has so much attention been given to the matter of sports. Over $1,500 in subscriptions was obtained from companies represented in the S. A. E. This amount was expended in prizes that were given for practically every kind of sport. There was an inter-section baseball series which was won by the Cleveland Section. Over forty-three started in the golf tournament. The tennis tournament extended over 3 days. In addition, there was the usual line of races, water sports, dancing, etc. One of the best physical instructors from Chicago was brought over to superintend the running of the sports, as these were looked upon as one of the features by which better relationships could be built up among the members.

On behalf of Ottawa Beach, it must be said that it came out of the session a real winner. Many were opposed to this place because of its inaccessibility, but once the members got here and experienced its exclusiveness and its possibilities for recreation there soon developed a spirit of approval, and before the end of the meeting the majority were asking to have next year's meeting he'd here.

Rust-Proofing of Iron and Steel

AN English correspondent calls attention to an item recently printed in AUTOMOTIVE INDUSTRIES relating to the Barff rust-proofing process. He says that this item was also printed in English motor papers, and that the process is not new but was introduced as the Bower-Barff rustless iron process 30 or 40 years ago by the late Professor Barff, who was an eminent metallurgist, and Mr. Bower, who is still living. He writes:

"The description of the process is fairly accurate, but I think the superheated steam was impregnated with tanning bark. It gave a discolored effect very similar to the Coslett treatment, which consists of boiling the parts in a solution of water and a small quantity of phosphoric acid.

"A more recent development of this class of treatments is sherardizing, which consists in saturating parts at a high temperature in a tumbler containing zinc dust. The common feature of all these processes is that they are not depository processes but saturating processes, demanding high heat and liquid treatment. In the case of the sherardizing process the zinc is brought to a vaporous state in an air-tight chamber or tumbling barrel, which is equivalent to liquid treatment. The recent X-ray diagnosis of metals discovery could have been anticipated years ago if the Coolidge tube had been invented earlier. Of course, it is only a further proof of the porosity of metals, however dense their structure may appear to be in the normal state."

TRACTOR seats cold pressed from open-hearth steel are said to differ from hot pressed seats in that they have a smooth surface and are free from waves and creases in the back. As compared with cast seats, these pressed steel seats are, of course, very much lighter, and it is claimed that they are more durable.

Why Congressional Aid for Business Is Imperative

MR. MANUFACTURER—Have you realized just what proportion of business promotion is politics? Have you realized to what extent it is your duty to demand certain things from Congress on behalf of your own business and for the prosperity of your employees and the nation? This presentation of the "Final Declaration" of the National Foreign trade convention is not only interesting, it is important.

By Allen Sinsheimer

THAT foreign trade is dependent upon prompt and adequate congressional legislation is emphasized in the "Final Declaration" of the Sixth National Foreign Trade Convention, just issued.

Manufacturers will find, according to the legislative needs outlined, that there is as close relation between the sale and shipment of spark plugs to Pernambuco, Brazil, and the Congress of the U. S. as there is between the development of motor cars in the United States and the construction of highways.

Without well-built, comprehensive highway systems, automobile sales are limited and equally, without prompt and sufficient merchant ships, adequate cables, reasonable tariffs and parcel post rates, the sale of American automotive products abroad is circumscribed.

Because the war has brought tremendous changes in foreign trade and converted the United States from a debtor to a creditor nation, states the Convention Declaration, the nations which are our debtors are confronted with economic problems and they will endeavor to curtail their purchases of finished products from us and enlarge their sales to us. These nations also will attempt to find an enlarged market.

This will result in sharp competition for our exports to neutral markets, which will limit outlets for American commodities, unless congressional legislation increases the facilities for American export trade and supplies to our manufacturers the equipment to meet all competition.

In consequence, Congress must heed the legislative needs of the exporter and the exporter must co-operate closely with Congress to bring about the requisite legislation. There must be early completion, states the Declaration, of the Government's present shipbuilding program, with revision of shipping, navigation, classification and measurement laws so that American vessels can compete equitably in foreign trade. There must be coal and fuel oil depots established on all great foreign trade routes so that American shipping will not be dependent on foreign and competitive-owned facilities for such vital service.

American cables and wireless to all important points throughout the globe are needed. The employment of connection facilities owned by competitors creates a serious handicap. For example, the single cable that forms the one direct connection between the United States and the Orient is often as much as eight days late and this loss of time allows competitive foreign exporters an important margin in the struggle for oriental business.

Realizing the advantage of prompt mail and express service to enable American enterprise to compete successfully for foreign contracts, the statement urges congressional consideration of suitable plans for development of aerial navigation, the development of commercial aeronautics and the promotion of airship service to overseas countries.

It suggests the legislation necessary to place commercial aeronautics under the Department of Commerce to aid both foreign and domestic markets. It suggests that local chambers of commerce should further the construction of public aerodromes in all important centers that expect to develop large foreign markets in order that prompt delivery of plans, specifications, blueprints and invoices can be made from and to shippers.

Establishment of free zones at principal American ports where products of all countries can be assembled, classified and re-shipped and the enactment of a bargaining tariff are urged. The necessity for extending international parcel post is emphasized and it is pointed out that the United States at present has parcel post connection with but half as many countries as Great Britain.

Adequate and competent representation of the State Department in all lands, together with proper compensation to provide for a greater number of commercial attachés and trade commissioners, is urged.

The necessity of American investment abroad, of legislation that will protect the American investor and the need for special and lower export railway freight rates to our seaports are urged, together with a general re-instatement of the export differential recognized prior to the war.

It is the duty of every manufacturer, whether for domestic or export business, states the Convention Declaration, to urge the proper legislation through his congressional representatives. Foreign trade is important, not only to the exporter but to the domestic manufacturer, because it lessens his domestic competition and in times of business depression it offers an outlet for merchandise.

Congress has heeded the combined requests of farmers who have organized and it heeds the demands of organized labor. It will likewise heed the demands of industry when they are concerned.

It is therefore the duty of every manufacturer to place the legislative needs of industry before Congress in concert with all other manufacturers, says the Declaration.

How and Why the Radical Leader Gains His Power

MANUFACTURERS are asking questions about the growth of radicalism. Some of them have accepted the answer imported from Europe that food hunger makes the radical and the Bolshevist. Mr. Tipper thinks differently. He believes that there is other hunger than that for meat and potatoes. He points out here how this hunger can be appeased

By Harry Tipper

THE economic developments of the last 25 or 30 years have brought into prominence, in a number of the industrial countries, a multitude of opinions having to do with the control of industry in connection with government. Some of these have developed into well organized political creeds and have secured a large following in many of the countries. Usually these platforms are included under the general term "Socialism" without any particular attempt to differentiate between the creeds or the methods which are proposed for securing their adoption. They range all the way from purely co-operative efforts to a completely bureaucratic system of common ownership.

These various political creeds have no particular relation to the labor movement as a whole and the principal exponents have come from among the ranks of professors, teachers and other so-called intellectuals.

They have been associated with labor largely because they have posed as friends of labor and have taught their political opinions in the schools, in so-called intellectual circles, and in the congested districts of the industrial cities. They have secured a considerable following among the ranks of labor principally because of the alluring promises which they have held out in connection with wages, with housing and with the theoretical dreams of a political economic government.

These political creeds, based upon one development or another of the collectivist idea in economics, have an entirely different history and growth from the occupational unions which developed out of the necessity for the protection of the interests of the various crafts in their demand for higher wages and shorter hours of work. The occupational unions grew out of the necessity for combined strength in order to bargain with the owners of industries, and they are still organized along these lines. Their main object is to protect the interests of the workman by wielding a large bargaining power.

As the occupational unions became powerful, the extent and character of the unrest with which they had to deal led them to turn to the economic political creeds and to enter politics in order to force government to undertake what they had not been able to secure from the industrial owners; or else in order to satisfy the growing demand among all classes of workers for political experiment, in the attempt to solve the industrial difficulties for which no solution had been offered by the older methods.

On the other hand, the followers of the extreme Socialist creed of political government seized upon the labor unrest to include in their platform statements as to the position of the worker, the abolishment of the capitalist system, so-called, the hours of labor and the control of industrial operations, using these as propaganda to secure the support of the foreign and younger elements in labor and, it must be admitted, with a considerable degree of success.

The Labor Party of Great Britain, which grew out of the desire of the labor unions to have some voice in Parliamentary discussions upon industrial matters, is an example of the way in which the Socialistic exponents used the economic necessities of the workers to further the adherence to their political doctrines.

The Labor Party in Great Britain, as a party, has ceased to represent organized labor for many years. Many of its leaders have never been members of occupational unions and are not included among the ranks of labor as at present organized in the factories. Its political platforms are concerned with a great many systems which were not within the province of the unions and which had no bearing upon the collective bargaining in industry for which the unions were formed and by which they became powerful.

In this country the radical exponents of collectivist political schemes have found their greatest following among unskilled and semi-skilled workers, particularly those speaking foreign languages and having a background of different political ideals. Few of the leaders of these organizations are workers in the sense in which the word is used in connection with the occupational unions. They are not concerned with the welfare of the worker as such, but they are concerned with the use of the worker and his political power as a means of furthering the adoption of their political creeds.

The power, the character and the operation of the federated unions of an occupational character stand in the way of progress for the radicals. So long as these occupational unions retain their power the radicals must find their greatest support among the unorganized who have no means of voicing their grievances, who are unacquainted with the orderly methods of organization and who are allured by the wild promises made in the platforms adopted by these radical organizations.

The platform of these various radical parties can be illustrated by reference to the creed of the Industrial Workers of the World. While the platforms of the different organizations vary to some extent in detail, the general object is much the same and they recognize the community of interests between the different organizations. The Industrial Workers of the World

stand committed to the absolute abolition of the capitalist system, to the control of all industries by the workers themselves, to the common ownership of property and consequently, to the completely collectivist form of political government. The platform itself makes no compromise and the propaganda with which the creed is developed is equally lacking in any idea of compromise.

Specifically, the Industrial Workers of the World favor revolutionary methods to secure the adoption of its political platform.

There are various organizations of social scientists, social economic leagues, national labor bodies, etc., concerned with the same general political creed and the same general program, although the propaganda which they issue does not call for the direct revolutionary method of forcing its adoption.

In this country the program of the Industrial Workers of the World has been actively promulgated for 20 years and in all the large industrial centers there are active centers of discussion devoted to the development of these political ideals and the increase of their influence within the ranks of the workers and in other quarters. In the meantime the same general political ideals have found their way into the colleges, and many faculty bodies contain men who are followers of these political creeds and active exponents of them.

This means that in a great many centers of higher education, under a certain number of the professors, the collectivist political creed is insinuated into the teaching and the student's mind familiarized with its advantages as outlined by its active disciples. Not only is this the case, but developments through the country show that among the teachers in the public and high schools of many cities there exists a large body of opinion favorable to this political development.

It will not be correct to say that these political ideas permeate our educational system, but it would be within the facts to state that no school system in any state is without some influence of this character, and in many of the larger centers the influence is of sufficient proportions to become important.

The ranks of all the professions contribute an important proportion to the intellectual leaders of these movements and a great many of the disciples fill the pulpits of churches in our larger centers.

The evils which arise out of the congested conditions in the larger industrial cities, the injustice to which the foreigners have been subjected through the padrone system and similar methods of employment, and the general belief that many of the conditions of our social life should not be allowed to go on, have prepared the ground work for such political creeds.

The consequence is that while the Industrial Workers of the World represent but a small proportion of the working population, and while there is little or no adherence to Bolshevism in this country, there is a tendency among a very large body of the people to see a solution of many of the important questions in governmental control and regulation of industrial matters, and in a measure of collective action in connection with the operations of industry.

This means that while there is little sympathy with revolutionary action, there is a great deal of sympathy with the collectivist idea of political economic government, and this sympathy finds expression in connection with the development of social unrest in the attitude of the public and in the attitude of other bodies of labor. The methods of the radical social reformers are very much akin to the methods which the Germans adopted before the war in their infiltration.

These social reformers are composed of many races. They are able to talk to any of the nationalities in this country in their own language. They are enthusiastic and ceaseless in their endeavors to obtain new recruits. Among the younger people who have a keen sense of the injustice involved in the present system of society and who have not learned by experience the slow development which is necessary in human affairs, the ideal of a common ownership by collectivist government and of co-operative effort in this respect, is very appealing. Among those who have no property, or no stake in the country, who live on a weekly wage and who have no responsibility either from a community, governmental or social standpoint, any change represents a possibility of improvement.

Among the workers, skilled and unskilled, there is a constant propaganda through the members of the occupational unions who are of these political opinions, through the centers for discussion which exist in every industrial city, through the promotion matter which is constantly being sent out in different languages. When unrest in any particular place begins to head up into a disagreement, the question involved in deciding upon the line of action to be taken to settle the disagreement almost always divides the labor organization into radical and conservative, the radicals being those who demand the most severe treatment.

At this point, the adherents of the revolutionary political creed, throwing their power and argument with the radicals, endeavor to prevent a settlement with the employers in an orderly fashion. In a number of cases which have occurred in the last year, the radical element among the ranks of labor involved in a dispute has been sufficiently strong to enable the I. W. W. to swing the disagreement into a strike and disorder.

It is said that Bolshevism is based upon hunger, and that may be true in the particular development of method which obtains in Russia, but Bolshevism as a political idea, that is, the control of the industry and government by the workers, is fed just as readily by the hungry mind and the dissatisfied mentality as it is by the physical hunger.

The I. W. W. propaganda and similar propaganda finds its strength in the failure of the present type of industrial organization and in the failure of the present type of social system to meet all the demands that have been placed upon it. *Inadequate transportation facilities, inadequate housing, congested quarters, dirty streets and unclean living* are just as important in their effect upon the political outlook of the worker as the physical hunger or the means of making enough money to have a decent margin of living.

Erroneous living, coupled with erroneous teachings in the public schools and colleges with a continual and active propaganda, and with an alluring theory, these conditions are responsible for the development of the irreconcilable radical element in labor in this country and similar bodies organized outside of the labor ranks.

Unless the manufacturer is willing to study the causes, the developments and the revolutionary political creed among the workers and the ramifications of the organization, also to study the social and industrial requirements in his own particular factory or community, the events of the last few years indicate there is a probability of growth in radical opinion and development of the collectivist political doctrine which will make itself felt in governmental circles and have its bearing upon industrial development.

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Help from Washington

IT is not necessary for a manufacturer to ask the aid of his congressman at Washington when in need of information, or other help, from a government department.

Writing to the congressman an inquiry about the removal of British automobile import restrictions means a week's delay. It means that the congressman must write to the Department of Commerce and await its reply before he can answer the manufacturer. If the manufacturer had written directly to the Department, he would have received an answer without delay.

It is a daily occurrence in the various departments to receive numerous letters from members of Congress asking for information for constituents. The departments need no congressional stimulant. They do not regard co-operation with the public as the conferring of a favor. They fully understand that government departments are bureaus of service at the command of the public. And it is only when some department may happen to fail that an appeal to a member of Congress might be helpful.

The Department of Commerce, to which business men look chiefly for commercial help, is one of the most human and helpful departments in Washington. Its doors are always open to business men. It goes far out of its way to obtain the necessary data. Any manufacturer requiring information, or other assistance, can be assured of a prompt and intelligent reply by writing to this department.

Future Passenger Car Design

UNDOUBTEDLY the most important point brought out by the symposium on the Future Passenger Car before the S. A. E. at Ottawa Beach is that the buyer will direct design tendencies in the future.

The design of passenger cars is not a pure engineering problem as, for instance, the design of factory yard cranes. Although, as pointed out at the session, the passenger car serves in this country first as a means of transportation and only to a much more limited extent as a means to amusement, still it is an important factor in our social life, and in consequence it is subject to influences based on social rivalry. In a strictly engineering product it would generally be considered an advantage if it conformed to the general practice of the time, even though that practice had not seen any modification for a number of years. In an article, however, that has to do with a person's social standing, distinctiveness and up-to-dateness are important characteristics.

J. G. Vincent, of the Packard Co., made the statement that the passenger car designer should be 50 per cent salesman and 50 per cent engineer. For instance, the question of how many cylinders it is best to employ cannot be properly solved on the basis of engineering considerations alone. He illustrated this by telling the story of the visit of a prominent British automobile engineer to a leading American automobile factory. After a trip through the plant the engineer told the manufacturer how much he was impressed with the fine organization and equipment of the plant and how much he thought of the manufacturer as a producer; but one thing he could not understand—how the manufacturer could have made the mistake of taking up the eight-cylinder engine when the four cylinder high speed engine would have given him the same desirable results, allowed him to cut the weight of his car almost in half and reduce the cost of construction correspondingly. "My dear ——," the manufacturer said, "you are a man after my own heart; I perfectly agree with all you say, the only trouble is that I could not have sold the four cylinder machines, whereas I can sell the eights."

Testimony of a similar nature as to what determines the trend of passenger car design was given by Mr. Belden, of the Willys-Overland Co., who said that they would equip all models except the low priced roadster with sleeve valve engines, because their agents called for these engines, and a sleeve valve air-cooled engine design was under development even for the roadster model.

In earlier years all designers were aiming at increased reliability, speed, flexibility and silence, and this largely determined the progress of design. Today there is no need for further increase in speed, flexibility and silence, and our better cars, at least, leave little to be desired on the score of reliability. The changing character of our fuel supply compels constant change in engine and carbureter design, and the need for fuel conservation might be expected to have a strong influence on design, but, as was pointed out at the meeting, it is to be doubted whether the American people will long stick to their newly-acquired habit of economy. During the war they were compelled to practise economy, but it did not agree with them any too well and they will soon return to their former habit of spending money freely in proportion to their means. Then that design of automobile will have the best chance which is calculated to most strike the public's fancy, without regard to whether it is the best engineering design.

U. S. Trucks in Norway

RECENT reports from Norway say that the post office at Christiania is experimenting with trucks for the transportation of mail within the city. The information at hand does not give the name of the trucks in use but merely states that the trucks were selected from a shipment recently arrived in that country. American truck exporters should be greatly interested in this experiment, as a study of a railroad map of Scandinavia indicates that this peninsula offers a wide field for truck transportation. Even the immense parcel-post business in Christiania was hauled by horse vehicles before the current experiment. There could be no better recommendation for American trucks in Scandinavia.

Torque Recoil

L. H. POMEROY, in his paper before the S. A. E. at Ottawa Beach, introduced a new term without, however, giving a definition of it. His idea probably was that the term recoil is so well understood that the meaning of his new expression would be self-evident. This, however, is not the case and some of his reasoning is rather confused.

We have been using the term torque reaction which, as applied to an engine, simply means the reaction on the engine frame which is equal and opposite in direction to the torque on the crankshaft. The torque diagram of the engine is generally constructed by taking into account the gas pressures and inertia forces of reciprocating parts, but leaving out of account the inertia forces of revolving parts.

It would appear from Mr. Pomeroy's paper that he takes the torque recoil equal to this torque reaction. While this is correct for engines with four or less cylinders, it is incorrect when applied to engines with more than four cylinders, as in these the torque impulses overlap.

A recoil is an impulsive motion and the meaning of the term may be legitimately extended to cover the force causing this motion. The torque recoil tends to turn the engine around in the opposite direction to that in which the crankshaft turns. This turning tendency is directly proportional to the torque on the crankshaft. If this torque were constant, the engine would assume a position of equilibrium, at a slight angle to its position of rest. But since the torque is fluctuating in character, the angular deviation of the engine from its position of rest will vary periodically; that is, the engine will have an angular vibration the amplitude of which depends upon the difference between the maximum and minimum torques on the crankshaft. It is this vibration which constitutes the torque recoil, and in the case of a multi-cylinder engine it depends not on the full torque but on the difference between the maximum and minimum values of the torque on the crankshaft.

Torque Curve as Sales Factor

WE fully agree with L. H. Pomeroy, the English engineer, in a paper read at Ottawa Beach, that a torque diagram is not a proper means to employ in selling a car to the public. It will not be understood by the layman and will give him an entirely incorrect impression of the propulsion characteristics of an engine. For instance, the torque diagram of a four cylinder engine passes through zero for each dead center position, and such a diagram is almost sure to give the layman the impression that a four cylinder engine propels a car by a series of impulses between successive ones of which there is an entire cessation of propelling effort.

Nothing could be further from the truth. The torque diagram is, in fact, a diagram of an entirely imaginary force, as it is impossible in a four cylinder engine, for instance, to point out any part and say that it is subjected to the torsional forces shown by the diagram. The point to which this would most nearly apply is that part of the crankshaft just inside the flywheel, but even here the torque has been materially modified by the angular inertia of the lower end of the connecting rods and that of the crankshaft. The propulsion characteristics are immensely modified by the flywheel and they are further modified by the weight and speed of all other moving parts between the flywheel and the tire treads.

A torque diagram is a useful thing in determining the flywheel capacity required for an engine and for other engineering uses, but it is an unreliable factor when judging the smoothness of running of an automobile.

WE DO not believe that AUTOMOTIVE INDUSTRIES would be doing its full duty to its readers if it did not call attention to the forthcoming description of the Salmson engine, the only aircraft engine that went through the war unchanged. It will be printed soon.

Michigan and Ohio Production Is Cut by Strike Epidemic

Curtailment 40 Per Cent, Owing to Walkouts in Parts Plants

Clearing Labor Situation Promises Early Improvement

DETROIT, June 27—Labor trouble in the automotive plants of Michigan and Ohio has curtailed production approximately 40 per cent. While, with few exceptions, strikes have not hit the automobile plants directly, they are occurring in the factories of the parts makers, causing a shortage of materials which is becoming critical. Passenger car manufacturers in the Detroit district cannot obtain sufficient parts to meet increased production demands, and they are going along on curtailed schedule.

This condition is perhaps most striking in the case of the Ford Motor Co. That factory's production sheet called for the manufacture of 3,500 cars daily in June. Although every effort was made to attain this mark, the highest point reached last month by this company was 3,000 cars. This was due directly to a shortage of bodies, of both the open and enclosed type, resulting from strikes at the Wadsworth Mfg. Co.'s plant, maker of the Ford sedan body, and the Wilson Body Co., which makes open bodies.

Material Shortage Hampers Production

The Paige-Detroit Motor Car Co. made 1500 cars last month and would have made twice that number if a steady flow of material could have been obtained. The capacity of this plant was 125 cars daily, but present production has been running from 60 to 75 cars. Officials say that in every instance where material shortage occurred it was due directly to labor trouble in the plants of the parts makers.

The Maxwell-Chalmers Corp. was similarly affected. No direct trouble occurred in its plants, except a few minor difficulties which were quickly adjusted. The Maxwell division planned to reach a production of 400 cars daily, but the best the company has been able to do to date is 200 cars. This concern is finding it hard to get competent workers, as well as material. The Chalmers division sales department is hundreds of cars ahead of production, but cannot boost its output because of a similar situation. From 50 to 70 cars are being made daily. This production would be increased 40 per cent immediately if material was available.

The Willys-Overland Co. is getting back into production after a tie-up of nearly 2½ months. The company is making a few cars daily. During June no completed cars were made. Just prior to the strike in April production was averaging 550 cars daily. C. A. Earl, vice-president and general manager, says the company will be back in fair production in about 30 days. This company and the Studebaker Corp.'s plant No. 3 of Detroit were among the few directly affected by labor trouble.

The Wilson Body strike caused the Hupp Motor Car Corp.'s production to fall off 1000 cars in June. In spite of this curtailment the company managed to average approximately 80 cars a day. Bodies are now coming through more regularly and production is going up again.

Production at the Cadillac Motor Car Co. has been limited by a material shortage. The company is running 70 cars daily, but will double this production within the next 60 days if the material and labor situations permit.

The Columbia Motors Co. is running 30 cars a day and is one of the few companies in Detroit which have been able to record a steady production increase. If the parts makers could supply material, this company would greatly increase its production.

The Liberty Motor Car Co. is running 40 cars daily, which is twice the capacity of its plant. The company states the material situation is bad, but inasmuch as its manufacturing facilities prevent further production increase, it is not greatly affected. The company has orders for more cars than it can manufacture, according to present schedule, in the next 16 months. Two new closed car models will be brought out next month.

The Oakland Motor Car Co., Pontiac, has experienced little labor and material trouble. Its production has reached the highest point in its history. Its daily output is now averaging 265 cars, which is an increase of 40 cars over May. Aug. 1 it expects the daily turnout will reach the 300 car mark.

The Barley Motor Car Co., Kalamazoo, is 1000 car orders ahead of production. The company is turning out 10 cars daily. The capacity of the plant is 20 cars per day. It is unable to reach capacity because of inability to secure sufficient bodies from Muncie, Ind.

Shortage of Homes Keeps Labor Out

The Olds Motor Works, Lansing, is having difficulty in getting small parts for universal joints, electric equipment, closed car bodies, proper cloth trimmings for closed cars and khaki tops for export jobs. On one or two occasions the material shortage became so acute that the plant was within 12 hours of closing down. On several occasions lately this company has faced the same situation. Even now, trucks are being shipped minus electrical equipment. This is made by the Auto-Lite Co., Toledo, whose employees have been on strike for some time. As the electrical apparatus arrives it is shipped to distributers and installation is made in the salesrooms of distributers and dealers. The Olds company is running 40 trucks and 140 passenger cars daily. Though there is a shortage of unskilled labor in Lansing, the company was obliged to discontinue a recruiting campaign in nearby towns, because a large number of men obtained in this way were unable to find homes.

MICHIGAN-OHIO OUTPUT 6,647 CARS A DAY IN JUNE

Passenger car production for the month of June as reported by the leading factories of Michigan and Ohio is as follows:

Car	Av. daily production
Buick	500
Briscoe	75
Barley	10
Cadillac	70
Chalmers	60
Chandler	100
Chevrolet	750
Columbia	30
Dodge	450
Dort	100
Ford	3000
Harroun	10
Hudson	100
Hupp	75
Liberty	40
Maxwell	200
Oakland	265
Olympian	12
Oldsmobile	140
Overland	...
Packard	25
Paige	75
Paterson	15
Jordan	15
Reo	125
Saxon	30
Scripps-Booth	50
Studebaker	165
Peerless	10
Winton	10
Essex	100
Grant	40
Total	6647

The production in May averaged 6688 a day, that in April, 7084.

The Reo Motor Car Co., Lansing, is speeding up production. It is turning out between 50 and 60 trucks and from 75 to 80 passenger cars daily. Production has not been hampered by material shortage. This is one of the few companies which have not been seriously affected. The Reo company is going to discontinue production of the 4-cylinder cars, substituting a 6-cylinder model instead.

The Briscoe Motor Corp., Jackson, is turning out 75 cars daily. This company had a large stock of material on hand and to date has not found it necessary to purchase more parts in any quantity.

The Detroit plant of the Studebaker Corp. is not hit hard by material shortage. Although it encountered some trouble from this source, the labor situation has cleared up and the company is now back in good production. The plant is turning out 165 cars daily and expects to increase this output within the next 30 days.

The automobile companies in Cleveland are finding their chief difficulty in obtaining parts from Detroit and other centers. What labor difficulties they have encountered have not been serious, and the result has been a sufficient production to cover Cleveland demands. The automobile companies here, dependent largely upon Detroit for certain materials, are having trouble.

The Peerless Motor Car Co. has had a hard time to get sufficient axles due to the Timken-Detroit Axle strike. This has caused production to vary greatly.

(*Continued on page* 37)

French Take Over A.E.F. Motor Park

Americans Give Up Verneuil—Deny Stories of Wilful Destruction and Illegal Sales

PARIS, June 20—Verneuil, the biggest reconstruction park of the Motor Transport Corps of the A. E. F. in France, was closed this week and is now in the hands of the French military authorities.

The park, constructed to take care of the reconstruction and salvage of all automobile material and of a considerable amount of Quartermaster material for the A. E. F., was in active operation slightly less than a year. Under the present arrangement, the French Government will take over the property and will dispose of it to the best advantage. It is not known whether the machinery will be pulled out of the buildings and sold separately, or whether the entire installation will be disposed of as it stands.

Verneuil is just one item in the big program the French are now handling on war material. The Government will take possession of all the American material not required by the army. This comprises all the automobiles, trailers, bicycles, motorcycles, and other rolling stock. The Motor Transport Corps has prepared a complete inventory of its material, together with its estimated price of each machine; this has been submitted to the French Government, which has appointed a group of technical officers to verify the list and the prices.

Until now, the material has been found satisfactory and the prices very reasonable. It is impossible, however, for the American authorities to sell anything in France, and the French are naturally unable to put any vehicles on the market until they have completed their arrangement with the Americans.

The situation in France is very incompletely understood, with the result that all kinds of wild stories have been circulated in the press. It has been claimed, notably, that the Americans are so dissatisfied at the delay that they have set fire to automobiles and trucks, rather than take them back to America. This is absolutely incorrect.

All the Motor Transport and Aviation parks have received instructions to clean up as far as possible, and in many cases, where material was not worth salvaging, they have set fire to it. Large numbers of truck and ambulance bodies, which have been through the war, are nothing more than junk. The wood is not worth salvaging; to dismount the bodies in order to get the metal would cost more than the work is worth.

On this account, these bodies were burned, and the remaining metal collected and sold as scrap. The French papers have construed this as a case of burning good automobile material.

Another case is that of motorcycles and sidecars. The army was entitled to sell these as scrap metal, but not as motorcycles. After a certain number had been sold it was found that the purchasers had been able to recover from them a few complete frames and had put these on the market as frames, thus putting the American Army in the position of having sold complete vehicles without permission from the French.

To prevent a repetition of this situation, the officer in charge of the camp gave orders that all the scrap motorcycles and sidecars should be smashed with a Holt caterpillar tractor before being sold as scrap metal.

The claim has also been made in the French press that societies such as the Y. M. C. A., K. of C., Red Cross, etc., have been selling their vehicles privately to dealers, who, in turn, have re-sold them at excessive profits.

It appears that only one of these associations has sold its vehicles, but even in this case they did not remain in France but were at once sent abroad. Major George H. Robertson, the old American race driver, who is now chief of transportation of the American Red Cross in France, evidently considers that he is specially signalized in this attack, for he has made a public statement in which he declares that no Red Cross automobiles have been disposed of in France.

Major Robertson states that by making these scandalous reports the French press has laid itself open to redress by law and that he has submitted the question of suit to his legal adviser.

FIAT PLANT IN U. S.?

TURIN, June 21—A special general meeting of the Fiat Co. will be held shortly, when the proposal will be made to increase the capital from 100,000,000 to 200,000,000 liras, nominally $40,000,000.

It is understood that the increase is contemplated in order to open factories, assembly plants, or selling agencies in countries where prohibitive tariffs exist. Such high customs duties now prevail, and appear likely to continue, not only in America but in all European countries, that it is difficult for Italian manufacturers to compete in these foreign fields. It is understood that Fiat is making arrangements to manufacture or assemble in America for the Amercian market.

GOODRICH IN YOKOHAMA

AKRON, June 30—The B. F. Goodrich Co. is forming a tire company in Japan. William T. Huston, mechanical engineer for the Goodrich company, has applied for a passport, intending to go to Yokohama where the branch is being built. It will be known as the Yokohama Rubber Co. The plant will be ready for machinery in a few weeks.

OLDS RAISES PRICE

LANSING, MICH., June 27—Effective July 1, the Olds Motor Works will increase the price of its 8-cylinder model $100, making the price $1,895. It is very likely, officials state, that new prices affecting other models will shortly be announced.

France Will Buy U. S. Army Vehicles

Government to Take Over Entire American Equipment for European Use

PARIS, June 30 (*Special Correspondence*)—The French government will purchase from the American army its entire automotive and kindred equipment in France, comprising 7575 passenger cars, 32,300 trucks and 40,000 motorcycles, bicycles and trailers. An inventory made by the Motor Transport Corps is in the hands of French officials and if the price arrangements are satisfactory the material will be taken over formally within a week.

The French authorities propose to distribute throughout the country and elsewhere in Europe the vehicles which the American army is without right to sell in France.

Michigan and Ohio Production

(*Continued from page* 36)

During June the Peerless company averaged 10 cars daily. Five thousand cars will be made this year. The plant's capacity is 10,000 cars annually, which it does not expect to reach. Additions to the Peerless factory are being built.

The Jordan Motor Car Co. is having trouble getting parts from Detroit, its most serious shortage being that of tops. The company is running 15 cars daily, and in addition to a complete new plant, which is now under construction, it has authorized the erection of an additional unit having a floor space of 30,000 sq. ft., to be used for stock purposes. The present Jordan plant has a floor space of 35,000 sq. ft., and the plant to be erected will cover 125,000 sq. ft.

The Grant Motor Car Co. is running five trucks and 40 passenger cars daily.

The Chandler Motor Car Co.'s production has been hit hard this week by a strike in the plant of the Interstate Foundry Co., Cleveland. This foundry supplies the Chandler company with cylinders and transmission cases, and the walk-out caught the automobile concern with practically no transmission cases on hand. The Chandler company, however, has other sources of supply and expects to be back at peak production within a week. During the month of June this company's average daily production was 100 cars. It is experiencing trouble in getting parts from Detroit.

The Winton Co. is running from 7 to 10 cars daily. The material situation has not affected production here to any great extent, although the company is having trouble in getting certain parts.

The Saxon Motor Car Corp. averaged 30 cars daily last month. This company is cleaning up production on its present models preparatory to bringing out a new series.

Commercial Vehicles Gaining in England

Interest Growing and Competent Agents Sought—Opportunities for Dealers

LONDON, June 15—(*Special Correspondence*)—The proposition of retail selling and service for motor trucks is attracting much attention throughout the United Kingdom. The leaders of the trade say that very soon there will be 100,000 trucks and commercial vehicles in use within the Kingdom. While this will be a considerable advance of the number in use, the best part of the outlook is that the number will probably increase very rapidly.

In consequence, interest in selling, garaging and repairing commercial vehicles is increasing even more than trade in passenger cars.

Truck makers and importers are conducting an earnest search for reliable and industrious agents. There is some difference of opinion as to the merits of factory branches and independent retail agencies, which time will solve.

For the first time in this country there is a prospect of competent mechanics for this work, who are the product of extensive use of motor power in the armies. Numbers of former unskilled laborers were trained in maintenance and repair work. A good many of these former soldiers are ambitious to have their own shops. Truck makers are receiving letters by the score from such men.

The trade sees considerable uncertainty as to the trend of this service, as the clients will be an entirely new class. The small shop keepers and light manufacturers, who are now buying these vehicles, have never before been a factor in the motor vehicle repair and garaging business, and they may have ideas of their own in placing their trade.

Coincident with this development is anticipated a lively increase in the handling of accessories and general truck equipment.

The *Motor Trader*, an industrial paper, outlines the changes in developments expected as follows:

Elimination of unnecessary steels and the source of trouble incident to heat-treating steels of varying contents.

Cheapening of replacement components and details resulting from the foregoing changes, and

Reduction of capital at present required to furnish and maintain adequately a garage-workshop for all chassis repairs.

Capital, at present up to 80 per cent locked up in plant, factory or repair-shop, will be available for developments in keeping with the new trend of business; or alternatively such business will be run on less capital, with advantage as regards the net turnover and liabilities.

Catering for a local truck trade will bring traders into touch with the business side of patrons, most of whom have been buyers or users of automobiles only.

The outcome will tend more and more to contracts for maintenance and the entire oversight of vehicles, and with the improvements of roads and the personnel of drivers, may call for a reduction in upkeep, repairs, and increased mileage.

Improved roads and their upkeep will demand special machinery and plant for the purpose. Some of it will be of a type not seen here in former years, such as ditching, trench cutters and clearers. All of it will find work for mechanics and mechanic-drivers.

Associated in this development will be farm machinery of every description, including a new line of implements suited exclusively to combustion-engined tractors.

The larger the growth of these associated trades the greater the scope for progressive mechanics and tradesmen, and, correspondingly, the more assured the status of the smaller tradesman, because of his wider opportunities.

The recent setting up of large centralized organizations with the promise of running their own provincial repair depots, etc., seems like curtailing the prospects of the small trader-repairer as regards cars and their upkeep, and possibly, too, the accessories for their maintenance; hence the greater incentive to traders in all categories to look into the prospects of the industrial vehicle, tractor, and farm and house lighting plant side of the business.

Thompson Made Stutz Manager

Treasurer Succeeds Founder—New Secretary of Stromberg

NEW YORK, June 28—William N. Thompson, treasurer of the Stutz Motor Car Co. of America, and right hand man of Harry C. Stutz for many years, will become general manager of the concern, succeeding Mr. Stutz, July 1. George F. Lewis, secretary of the company, in making public the promotion to-day, stated that Mr. Thompson, having been on the ground at Indianapolis during the various stages of Stutz progress, was a logical successor to the retiring manager, who has also relinquished the presidency of the corporation, remaining only as a director. Mr. Thompson will continue to act as treasurer.

Mr. Lewis, who became secretary of the Stutz company with the ascendency of Allan A. Ryan, the banker, to the presidency, also was elected secretary of the Stromberg Carbureter Co. of America, of which Mr. Ryan is vice-president, at its annual meeting this week. He succeeded Kenneth R. Howard of the Ryan offices, who had been secretary of both companies.

The Stromberg company re-elected its directors. Officers chosen, in addition to Messrs. Ryan and Lewis, were: President, Charles W. Stiger; treasurer, George H. Saylor.

Summer Best Time for English Shows

No Truck Show Foreseen for Year—Olympia Too Small to Admit Imported Cars

LONDON, June 15—A usually well-informed correspondent of a British motor trade paper does not anticipate that there will be a truck show earlier than about July of next year. Some manufacturers will not be ready to participate much before that time. They certainly do not want to follow closely on the touring car exhibition, because the latter is the more popular event, and they would be over-shadowed by it.

The summer is probably the best time for a commercial vehicle exhibition, partly because it is the time when numbers of visitors from all parts of the world are in the country, and when, consequently, there is really a chance of introducing goods to people who would not otherwise see them.

It will not be surprising if, before long, it is suggested that even the touring-car show should be held not more frequently than once in two years and during the London summer season, when oversea traders are in this country. Besides, Olympia is too small for an effective display and its organizing show committee, the Society of Motor Manufacturers and Traders, does not favor provincial motor shows.

The size of Olympia is the chief factor concerning the possible exclusion of imported cars and, in fact, a year or two before the war the same cars in the imported category were excluded for that reason. At the same time there was a growing complaint of exhibitors as to the preference in space and position accorded to certain interests, and it was not unknown for cars of the same make to be duplicated here in two and even three exhibitors' stands.

Manifestly a national or international show should be representative of all concerns and not discriminative against any make, provided the would-be exhibitors were willing to abide by the rules and practice of the ruling body with which they were associated. So strongly did some of the import trade resent these actions that an independent show was discussed and may yet be run, if the import restraint is not considerably modified.

TIRE MAKER DIES

PARIS, June 20—Senator Pirelli, head of the Pirelli Tire Co., Milan, Italy, is reported to be among the twenty-three persons drowned as the result of the sinking of the cable laying steamer Citta-di-Milano. The vessel was sunk in the Mediterranean, near the Filieudi Island.

Senator Pirelli founded the Pirelli company, which is at the present time the biggest organization of its kind in Italy. He was a strong supporter of the aviation movement.

British Dirigible Starts for America

Giant Naval Craft Expected to Fly 3,200 Miles Across Atlantic in 70 Hours

NEW YORK, July 2—The British Dirigible R-34, which sailed from East Fortune, Scotland, at 1.48 a. m. Greenwich time to-day, is expected to land at Roosevelt Field, Mineola, July 4.

Though the time of arrival is uncertain, owing to the possibility that the giant craft may not follow the scheduled 3200-mile course by way of Newfoundland, it is expected that a landing will be made late in the evening of Independence Day, after a cruise occupying approximately 70 hours. This would require an average speed of 45 to 46 m.p.h., of which the dirigible is easily capable.

There is a chance that wind and weather conditions may dictate a course by way of the Azores, which would be little longer than the Newfoundland route, or direct from the British Isles to Long Island, which would cut the estimated flying time almost a full day.

The R-34 was built by William Beardmore & Co., Ltd., at Inchinnan, Renfrewshire, Scotland, for the British Admiralty. The ship is 634 ft. in length by 80 ft. in diameter, is constructed of 19 separate gas bags inside the rigid outer envelope. More than 2000 cu. ft. of hydrogen gas is used and the lifting power has been demonstrated at more than 30 tons. She is fitted with Sunbeam engines and the maximum speed is estimated at 70 m.p.h. under the most favorable circumstances. The normal compliment of the ship is 30 men, which includes several technical members.

The formal tests of this craft included the flight of 4½ hrs. in which she made good speed at altitudes up to 2000 ft. Later tests included a non-stop flight of 19 hrs. in which a diversity of weather was encountered. A severe test was the result of the R-34 being lost in the fog and remaining in the air 21 hours and returning to her hangar under her own power.

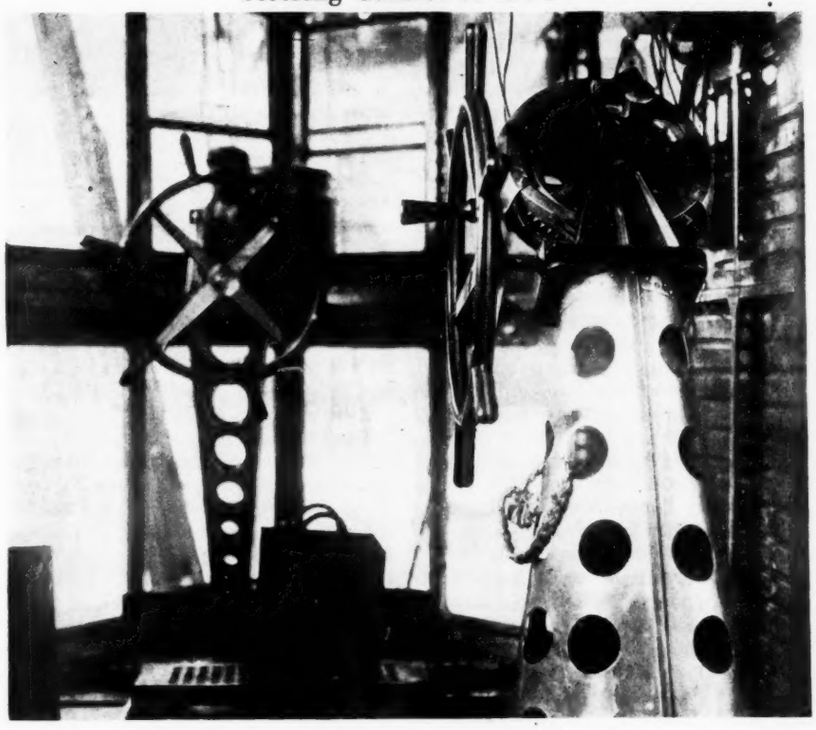
Major Scott, in command of the flight to America, has expressed the opinion that under normal conditions the R-34 could sail to Long Island and return without replenishing her supply. He compared this flight, under favorable weather conditions, as a less effort than the recent 56 hr. flight over the Baltic Sea under most adverse conditions.

The British Admiralty did not permit any advance statement as to the amount of fuel and other supplies on board the ship.

GOODRICH WAREHOUSE

NEW YORK, July 2—The B. F. Goodrich Rubber Tire Co. has leased a six-story concrete and steel building built for the army at Hoboken and will utilize it as an export and Atlantic seaboard distributing station.

Steering Control of R-34



Eastern Syndicate After Ford Stock?

Minority Shareholders Indicate Negotiations Are in Progress

NEW YORK, July 1—Persistent reports of negotiations to acquire the minority and, eventually, it is presumed, the majority stock of the Ford Motor Co., have made their reappearance after several weeks' quiet, this time naming an eastern syndicate as an alternate to the General Motors Corp. as the would-be purchaser.

One story has mentioned a New England trust company, supposedly acting for New York interests, as seeking to buy the shares of minority stockholders. Investigation here has failed to reveal the identity of the supposed negotiators, while admissions have been made by Ford minority interests in Detroit that a sale was likely.

As far as the General Motors Corp., with its associated du Pont connections, is concerned, no such negotiations are in progress, it was said to-day at the offices of President W. C. Durant. The company denied any intention of attempting to acquire Ford shares, in any quantity. At the same time the company also disposed of reports that it proposed to acquire control of Continental Motors and the Goodyear and United States tire concerns.

Ford officials, according to a dispatch from Detroit, have declined to discuss the reports of impending stock transfers, but some of the minority stockholders have made statements which practically confirm the fact that a deal for the purchase of that portion of the stock is pending. David Gray, of Detroit, one of the minority stockholders, said it was very likely that a sale would be effected. Half a dozen interests had been trying to get the stock, he said, but only one was being seriously considered. He would not name that interest. H. H. Rackham, another stockholder, declared that rumors of such negotiations had been heard for a long time. He would neither deny or affirm the truth of the present reports.

Ever since Henry Ford announced that he would bring out a $250 automobile, to be made by a company entirely independent of the Ford Motor Co., rumors that he would probably withdraw from the Ford company have been prevalent. At one time it was said that an agreement for the purchase of the Ford stock by General Motors was practically complete. This deal, according to rumor, was held up because there was a difference of approximately $10,000,000 between the price offered and that asked by Mr. Ford. It was said that General Motors was willing to pay $187,000,000 for the Ford stock. Another obstacle preventing the sale at that time is said to have been the refusal of Mr. Ford to sign an agreement not to manufacture a passenger car at a future date.

For the last year Henry Ford has been paying much more attention to his tractor interests than to his automobile plant. In this connection it is pointed out that he has achieved his ambition to become the leading passenger car producer in the world and now desires the same rank in the tractor field. To accomplish this he would willingly withdraw his capital from the Ford company to invest it in tractor expansion, it is said.

May Exports Are Normal

WASHINGTON, July 1—Although the British embargo and the almost prohibitive duties of France have had their effect on our automotive exports, the totals for May, 1919, are considerably ahead of those for May, 1918, and are approximately equal to the figures for April, 1919.

The actual figures call for little comment, but it is interesting to observe that our European trade (outside the United Kingdom and France) is satisfactory. We are maintaining our position with Denmark, Norway and Spain.

In Latin America we are doing considerable business in passenger cars, but the truck business is far from satisfactory. The good roads movement is gaining impetus in South America and the field for truck sales is increasing rapidly.

Australiasia is now one of our best customers and there is every indication that both Australia and New Zealand will continue to import American cars. Under the head of "Other Countries" come China, Japan and the Orient generally. These countries offer big opportunities and increasing trade may be anticipated. Our exports of parts are fully maintained.

STORAGE OF GOVERNMENT VEHICLES

CHICAGO, June 23—Every motor vehicle in the U. S. Army department, from tanks to trucks, is being mobilized and moved to the municipal pier for storage. Included in the lot are 1644 bodies for army artillery supply trucks, whose worth is estimated at $1,000,000, which have lain in a vacant field for five months, or ever since the Dunbar Drop Forge Co. finished them. Any weather damage is to be repaired by Dunbar. As the bodies are of 16-gage black sheet steel there has been no depreciation due to weather, Government officials say, and all the repairs needed are a little paint and replacements for warped woodwork, which will be made by the company.

The truck bodies are the type adopted by the Ordnance Department shortly before the armistice. The company finished 813 on a $500,000 contract and 2666 more were on order. The armistice decreased this to 1966, and on delivery, 1644 were stored in the open field.

The bodies will be mounted, as planned, on Nash chassis. The design is such that every tool needed to repair a gun, from heavy field pieces to Lewis machine guns, is carried. The truck also is arranged so that on reaching a damaged gun it becomes a flat steel platform, helping make quick repairs.

Exports of Automobile Equipment for May and Ten Previous Months

	1918		1919		1918		1919	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	1	$10,000	4	$40,000	19	$202,620	47	$617,600
Airplane parts	....	771,678	....	63,483	....	7,268,474	....	11,249,456
Commercial cars	859	1,966,637	1,158	2,433,375	11,371	29,872,971	11,141	29,247,016
Motorcycles	627	147,055	2,639	794,175	9,436	2,078,689	11,331	2,930,108
Passenger cars	2,801	2,907,390	5,218	5,517,121	49,214	42,522,903	33,412	37,527,142
Parts, not including engines and tires	....	2,859,496	....	3,812,393	....	29,737,653	....	32,657,496
Total	4,288	$8,662,256	9,019	$12,660,547	70,040	$111,683,310	55,931	$114,228,818

	1918		1919		1918		1919	
Engines	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas	2,210	$208,371	3,740	$533,052	33,463	$3,873,363	24,196	$3,734,981
Marine, gas	580	342,407	873	584,898	6,985	2,464,075	7,008	3,664,367
Stationary, gas	3,200	418,505	2,113	263,242	25,640	2,920,413	21,571	3,052,727
Tractor, gas	2,832	2,741,772	965	1,017,128	22,371	22,466,365	18,773	20,319,021
Total	8,822	$3,711,055	7,691	$2,398,320	88,459	$31,724,216	71,548	$30,771,096

Exports by Countries for May, 1919, and Eleven Months Ending May, 1919

	Cars		Trucks		Cars		Trucks	
	No.	Value	No.	Value	No.	Value	No.	Value
Denmark	109	$138,191	....	.....	382	$570,433	....	.....
France	76	299,238	177	$746,500	758	1,224,925	3,533	$14,844,762
Norway	102	159,994	....	.....	429	799,000	....	.....
Russia in Europe	....	.....	....	.....	6	6,605	....	.....
Spain	85	83,515	....	.....	765	934,503	....	.....
United Kingdom	140	200,167	8	13,615	391	545,127	877	2,544,654
Canada	1,012	1,035,167	200	335,849	4,802	4,526,598	1,856	3,359,505
Mexico	312	235,163	....	.....	1,951	1,800,733	....	.....
Cuba	337	312,768	67	133,281	1,887	2,547,885	610	1,192,086
Argentine	203	223,887	4	10,096	1,470	1,788,461	53	106,459
Chile	22	16,418	....	.....	1,029	1,585,379	....	.....
Uruguay	284	198,583	....	.....	1,203	1,100,742	....	.....
British India	98	108,738	....	.....	349	421,700	....	.....
Dutch East Indies	148	163,194	....	.....	2,063	2,654,927	....	.....
Russia in Asia	35	26,045	....	.....	41	39,679	16	22,000
Australia	149	154,936	....	.....	2,878	2,753,254	....	.....
New Zealand	192	221,114	....	.....	1,488	1,548,289	....	.....
Philippine Islands	340	322,201	....	.....	1,601	1,724,631	....	.....
British So. Africa	239	394,511	....	.....	1,161	1,356,125	....	.....
Other countries	1,335	1,228,301	702	1,194,034	8,758	9,598,146	4,196	7,177,550
Total	5,218	$5,517,121	1,158	$2,432,375	33,412	$37,527,142	11,141	$29,247,016

Prices Raised on Cars and Trucks

DETROIT, June 28—The Hudson Motor Car Co. has raised the price on Hudson and Essex models. On Hudson cars the increase is $125, while the Essex price has been raised $200. Increased cost of materials and labor, it is said, forces the company to take this action. The new prices, which went into effect June 26, are as follows:

Model	New Price	Old Price
Hudson		
Seven-passenger Phaeton	$2,100	$1,975
Four-passenger Phaeton	2,200	2,075
Sedan	2,900	2 775
Cabriolet	2,575	2,450
Coupe	3,075	2,950
Touring Limousine	3,425	3,300
Limousine	3,775	3,650
Essex		
Phaeton	1,595	1.395
Five-passenger Sedan	2,250	2,250

The new Essex roadster has just gone into production, the first complete cars of this model being due in a few days. The price will be announced later.

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NEW YORK, July 2—The Autocar Sales & Service Co., Inc., announced today, on behalf of the Autocar Co., increases effective Aug. 1, on its 97 and 120-in. wheelbase motor trucks from $2,050 to $2,300 and $2,150 to $2,400 respectively.

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SOUTH BEND, July 2—An advance of $100 on Studebaker light touring models and $150 on sedans, coupes and the Big Six touring, effective to-day, have been announced by the Studebaker Corp. of America. The chassis of each model is $100 less than the touring body, and all prices quoted are f.o.b. Detroit.

Present prices are as follows:

Models	New Price	Old Price
Light 4 touring	$1,325	$1,225
Light 6 touring	1,685	1,585
Club roadster	1,685	1,585
Light 6 coupe	2,435	2,285
Light 6 sedan	2,535	2,385
Big Six touring	2,135	1,985

TRUCK DEMONSTRATION

WASHINGTON, June 28—A motor truck parade in which 304 trucks took part under the direction of the Washington Automotive Trade Association and the Motor Transport Corps, U. S. Army, was held here to-day. The trucks were of all types and descriptions from light delivery to heavy army vehicles. Brigadier General C. B. Drake, Chief of the Motor Transport Corps, was the Grand Marshal and led the parade which included the complete army truck corps that will journey from Washington to San Francisco, beginning July 7.

Truck, tire and parts dealers, owners and government and municipal truck operators entered. Autocar and Packard each had 39 trucks in line and others included the Grant, Oldsmobile, Mack and Nash. Several German trucks were included.

Detroit Spending Millions on Buildings

Homes and Factories Going Up—Demand Still Ahead of Supply —Production Way Up

DETROIT, June 27—Detroit is now building homes and factories at a cost of between $1,500,000 and $2,500,000 weekly. The building work is not in keeping with the demand, however. The shortage of manufacturing space here is almost as great as the shortage of homes, and Detroit still needs thousands of dwellings.

At the Chamber of Commerce it is estimated that in Detroit and in adjacent territory over $100,000,000 is being spent in industrial construction alone. Sixty per cent of this is in Detroit, mostly in the automotive field. Approximately 75 per cent of her business is normal or above normal, and of the 25 per cent below normal 51 per cent is rapidly improving.

Bank deposits are larger than they ever have been both in commercial and savings accounts. Wages are higher than ever before and continue to go up. There is a shortage of labor and plenty of work everywhere. The last three months has seen scores of new companies formed, most of them starting in a small way, but are rapidly expanding.

The volume of raw material coming to Detroit is so great that it is hard to find warehouse space.

Passenger car production is hitting a high mark. Labor troubles are dying down and the excessive labor turnover prevalent for several months is beginning to recede. The truck business is getting new impetus and production is running into fair figures. Truck manufacturing is now approximately 70 per cent normal and some companies are reporting abnormal business. The parts makers are getting into full production.

HOLMES FOUNDRY BUILDINGS

PORT HURON, MICH., June 27—The Holmes Foundry Co. will have its first new foundry unit completed and in operation by Aug. 1. Several more foundry units will be erected at once. Work has already started on the second unit.

CHELSEA STEEL BALL ADDS

CHELSEA, MICH., June 27—The Chelsea Steel Ball Co. will put in 12 new dry grinding machines. The entire production of this company has been sold for the next 3 months.

VAN AUKEN BUILDING PLANT

PONTIAC, MICH., June 27—The Van Auken Co., builder of automobile tops, will erect a plant here. Ground will be broken this week for the first unit. The factory will be of concrete, steel and glass, and will be completed in 30 days. A steam power plant with a blower system will also be built.

The Van Auken Co. was organized but two years ago. It is doing work for the General Motors Truck, Oakland, du Pont and Ford interests. The company has been running at a capacity of 24 hours a day.

HIGHLAND BODY BRANCH

DETROIT, June 27—The Highland Body Co., Cincinnati, has leased the Detroit United Railway property in the north part of the city and will establish a branch factory, warehouse and service station. The branch will be in charge of P. H. Willis, recently in charge of government aviation truck production.

TRACTOR COMPANY BUILDING

DETROIT, June 27—The Detroit Culto-Tractor Co., recently organized to market a light 3-wheel gasoline farm tractor, will not be in production until September. The company recently purchased a garage and must rebuild it to make it suitable for manufacture.

NATIONAL COPPER BUILDS

CLEVELAND, June 28—The National Copper & Smelting Co. has taken a 99 yr. lease on a 4 acre site here on which it will build a plant. The concern manufactures seamless brass and copper tubes. It recently bought the Erie-Buffalo Tube Co. and also the Michigan Tube Co., Detroit.

SHULER AXLE FOR DETROIT

DETROIT, June 28—The Shuler Axle Co. has increased its capitalization to $500,000 and will build a plant in Detroit, it is reported. This company recently moved to Louisville, Ky., and had a plant built.

NEW CASTINGS COMPANY

MILWAUKEE, June 28—The Great Lakes Malleable Co. has been organized with a capital stock of $100,000 to produce malleable castings for the automotive and agricultural machinery industries. The incorporators are F. J. Vea, C. M. Osterheld and Chris O. Egeland.

NEW GRINDING MACHINE CO.

BELOIT, WIS., June 28—E. B. Gardner, formerly secretary of the Gardner Machine Co., has organized the Badger Tool Co. with a capital stock of $75,000 to manufacture and market a new line of grinding machinery for the automotive industries. A plant is being equipped and will start production in July. Mr. Gardner is president; C. E. Cadman, vice-president; H. I. Kelley, secretary, and R. D. Gardner, treasurer.

SILVUR LINED MOLD

INDIANAPOLIS, June 28—A mold for retreading impaired, reconstructed and rebuilt tires, known as Haywood's Silvur Lined Mold, has been put on the market by the Haywood Tire & Equipment Co.

200 Cars A Week Plan of Marmon

$2,500,000 Enlargement of Plant to Be Undertaken at Once

NEW YORK, June 28—Two hundred completed cars a week instead of the present 100 will be the output of the Nordyke & Marmon Co.'s plant upon completion of extension work to be financed by its $2,500,000 note issue announced early this week. F. E. Moskowics, vice-president, came here from Indianapolis to-day in connection with the financing arrangement, which is being handled by the Bankers Trust Co. He said that contracts have been let for the new buildings, which will provide 400,000 sq. ft. additional floor space, and for new mechanical equipment. A 14-acre plot of ground recently acquired will be utilized.

Mr. Moskowics added that the company's extensive production of Liberty motors had prompted steps to enlarge the car output correspondingly. It is hoped, he said, that the construction work can be hurried forward to permit early utilization of the expanded plant.

NEW BROACHING COMPANY

DETROIT, June 27—The Crystal Alloys Corp. has been succeeded by the United Broach & Machine Co. The new company is continuing the manufacture of alloy broaches and is also engaging in the production of broaching appliances, tools, fixtures and special machinery in general.

LIMOUSINE TOP CAPITAL

KALAMAZOO, MICH., June 30—The Limousine Top Co. will increase its capital stock from $100,000 to $200,000 at once. The concern has abandoned the manufacture of demountable tops and makes limousine, sedan and coupe bodies exclusively. The working force numbers 250.

THRESHER FOR FORDSON

PORT HURON, MICH., June 27—The Port Huron Engine & Thresher Co. has placed on the market a small threshing machine, designed to operate in connection with the Fordson tractor. The thresher is being handled throughout the country by Fordson tractor dealers.

BICYCLE WHEEL IN PRODUCTION

MILWAUKEE, June 30—The Briggs & Stratton Co. is investing $400,000 to $500,000 in new buildings and equipment, and will pay particular attention to the production of the Smith Motor-Wheel, a gas engine appliance for bicycles, heretofore made exclusively by the A. O. Smith Corp.

MEYERS SPARK PLUG

TOLEDO, June 28—The Meyers Spark Plug Co. has been organized here with a capitalization of $100,000.

Equal Pay for Women Urged for Equal Work

English Committee Investigating Wage Relations Finds Conditions Unsatisfactory

WASHINGTON, June 27—That women replacing men in industry should receive equal pay if their production is equal to that of the men, is the basis of a report filed by a committee appointed in Great Britain in September, 1918, to investigate the relation to be maintained between the wages of women and men, considering the interests of both, as well as the value of their work.

The committee reported in favor of equal pay for equal work, taking into consideration the output by women as contrasted with that by men. It found that a basic subsistence wage regulated by law is a necessity, and that such a wage should be adjusted periodically to meet variations in the cost of living. Where women are doing the same work as men for less wages, the wages should be regulated by agreements as to the relative value of the work between the employers and trade unions acting for the workers.

In event that it is necessary to first train female workers until they achieve the efficiency of men, employers are entitled to fix a probationary period at a lesser wage. Where there has been subdivision of a man's job, and a woman is put on to do only a part of the job, the wages should be regulated so that the labor cost to the employer of the whole job is not lessened, and payment to the various women engaged on the job should be proportioned according to their respective outputs. Likewise, if the introduction of women workers results in simplification of processes or machines, the time rates are to be determined as if they are allocated to male labor less skilled than that employed before the simplification. The burden of proof that a woman's work is less productive than a man's rests with the employer.

The necessity for regarding the health of women workers and increasing their efficiency by means of sanitary and comfortable working conditions is emphasized. Government pensions for widows and for deserted wives with children is advocated, and a scale of wages for girls under 18 amounting to 50 cents a week less than a woman's subsistence wage is urged, while the employment of girls under 16 is declared detrimental to the welfare of the nation.

The minority report claims that it is not possible to formulate a working plan on the basis of "equal pay for equal work" because this is ambiguous and easily evaded, and claims that the time has come when workers should all be treated and regarded alike regardless of sex.

Following is the complete report:

Priciples that should govern future relation between men's and women's wages:

1—That women doing similar or the same work as men should receive equal pay for equal work, in the sense that pay should be in proportion to efficient output. This covers the principle that on systems of payment by results equal payment should be made to women as to men for an equal amount of work done.

2—That the relative value of the work done by women and men on time on the same or similar jobs should be agreed between employers and trade-unions acting through the recognized channels of negotiation, as, for instance, trade boards or joint industrial councils.

3—That where it is desired to introduce women to do the whole of a man's job and it is recognized that either immediately or after a probationary period, the length and conditions of which should be definitely laid down, the men's time rate.

4—That where there has been subdivision of a man's job or work without any bona fide simplification of processes or machine and a woman is put on to do a part only of the job or work the wages should be regulated so that the labor cost to the employer of the whole job should not be lessened, while the payment to the persons engaged on it should be proportioned to their respective labor contributions.

5—That where the introduction of women follows on bona fide simplification of process or machine the time rates for the simplified process or simplified machine should be determined as if this was to be allocated to male labor less skilled than the male labor employed before simplification; and women, if their introduction is agreed to, should only receive less than the unskilled man's rate if and to the extent that their work is of less value.

6—That in every case in which the employer maintains that a woman's work produces less than a man's the burden of proof should rest on the employer, who should also have to produce evidence of the lower value of the woman's work to which the fixed sum to be deducted from the man's rate for the particular job throughout the whole of the industry should strictly correspond.

7—That every job on which women are employed doing the same work as men for less wages should be considered a man's job for the purpose of fixing women's wages, and the wages should be regulated in the manner above recommended.

Equal Pay for Equal Work

8—That the employment of women in commercial and clerical occupations especially requires regulation in accordance with the principle of "equal pay for equal work."

9—That in order to maintain the principle "equal pay for equal work" in cases where it is essential to employ men and women of the same grade, capacity and training, but where equal pay will not attract the same grade of man as of woman, it may be necessary to counteract the difference of attractiveness by the payment to married men of children's allowances, and that this subject should receive careful consideration from His Majesty's Government in connection with payments to teachers to which the Government contributes.

10—That the principle of "equal pay for equal work" should be early and fully adopted for the manipulative branches of the civil service, and that in the case of postoffice duties the question of the men having late hours or night work should be provided for by an extra allowance to persons undertaking common duties under disagreeable conditions.

11—That this principle with regard to allowances to persons undertaking common duties under disagreeable conditions should be applied also to industry.

Principles for Future

15—That in those trade processes and occupations which the experience of the war has shown to be suitable for the employment of women, employers and trade unions acting through the recognized channels of negotiation, should make possible the introduction of women by agreements which would insure in the manner above indicated, that this did not result in the displacement of men by reason of the women's cheapness to the employer.

16—That with a view to improving the health and so increasing the efficiency of women in industry:

i—There should be a substantial reform and extension in scope of the factory and workshops acts, with special reference to (a) the reduction in the hours of work (including arrangement of spells and pauses, overtime, night work); (b) the provision of seats, labor saving devices, etc., to avoid unnecessary fatigue; (c) an improved standard of sanitation (sanitary conveniences, lavatories, cloakrooms, etc.), ventilation and general hygiene; (d) the provision of canteens, rest rooms and surgeries; (e) the general supervision of the health of the workers individually and collectively; and (f) the conditions under which adolescents should be employed.

ii—The present factory medical department at the home office should at once be strengthened by the appointment of an adequate and suitable staff of women medical inspectors of factories, and that a considerable increase should be made to the present staff of lay women factory inspectors.

iii—A local factory medical service should be established with duties of supervision, investigation, and research intimately co-ordinated with the school medical service under the local education authority, the Puolic Health Service under the local sanitary authority and the medical service under the National Insurance Act or ministry of health when established.

17—That the Ministry of Labor, with which should rest the duty of ascertaining both nationally and locally the demand for trained persons in any trade or occupation should, through central and local trade advisory committees,

(*Continued on page* 48)

British Import List Announced

Board of Trade Journal Notes Articles for Import to United Kingdom Without License

LONDON, June 10—Articles which may be imported into the United Kingdom without license are set forth in the current supplement to the Board of Trade Journal. Those of automotive industry interest are:

Aluminum powder, sheets, foil, circles, rods, bars, ingots, angles, wire, tube, and strip.

Bench drills, bolts and nuts, calipers, castings bronze (machine or phosphor bronze).

Cells, Edison and component parts, for electrically propelled vehicles.

Celluloid in sheets, rolls, rods, chucks.

Cycles, metal parts, and accessories of, other than bells, cranks, frame lugs, hubs, including coaster hubs and hub shells, variable speed gears, pedals, frames, free-wheel clutches, forks, chain wheels, handle bars, lamps (other than electrical), rims.

Dial gauges, die heads, dies and die stocks, drill presses, drill sleeves and sockets, drills, electric searchlights, emery wheel pressers, expanding mandrels, friction clutches, gauges.

Grease cups, gutta percha, hammer heads (iron), hammers (engineers), hammers (lead), instruments and apparatus (scientific), jacks, motor cars, and track, lathe carriers, lathe dogs, lubricators, machine tools and parts thereof, machine vices, malleable tube fittings.

Measuring tapes and rules (except wooden rules) including verniers, measuring instruments (electrical, of all kinds, with 4-inch dials and below).

Metals and ores and manufactures thereof.

Ores — Antimony (micrometers), other sorts, except gold.

Manufactures — Iron and steel, pig iron, ingots, blooms and slabs, puddled bars, wrought, in bars, angles, rods, and sections, ship, bridge and cockle plates and sheets, rails, tires and axles.

All other heavy iron and steel which does not fall under the heading of hardware.

Other metals (not being hardware)—mica.

Motors (electric, up to ¼ h.p.), lubricating oils.

Painters' colors and pigments—Asphaltum, bitumen for black varnish, bone pitch, Brunswick black, burnt sienna, bone black, carbon black, carmine. China ink, Chinese ink, cinnebar native, cobalt oxide, earth colors, earth sienna, gamboge, gamboge gum, Indian ink, imitation gold leaf, lime green, ochre, orpiment, umber, zaffre.

Pumice stone and pumice powder.

Reamers.

Rubber manufactures other than tires, boots and shoes, and stationery articles, spanners, springs for the upholstery trade, talc. French chalk, steatite, time recorders and parts thereof, tool holders, varnish (not containing spirit), wires, flexible for telephony and house wiring.

The same supplement makes note that among the articles that can be imported, with license when needed, are: Manufactures of aluminum, except sheets, foil, circles, rods, ingots, angles, wire, tubes and strip, also powder and hollow-ware.

FORD TO RETURN PROFITS

WASHINGTON, June 27—Henry Ford has requested Secretary of the Treasury Glass to send an expert to examine the books of the Ford Motor Co. to determine the amount of profits received by the Ford company on war contracts. Mr. Ford desires to return his share of these profits, amounting to 58½ per cent, to the Government. Commissioner of Internal Revenue Roper has instructed the Detroit branch of the Internal Revenue Bureau to supply Mr. Ford with expert assistance.

WILLYS-OVERLAND OUTPUT

TOLEDO, OHIO, July 2—The Willys-Overland Co. is gradually bringing its production back to normal after its three months' strike tie-up. With 5500 men at work in the Toledo plant, 2000 at Elmira, N. Y., and 500 at Elyria, Ohio, a fair output of cars is reported.

SAVOLD PLANS ANNOUNCED

NEW YORK, July 2—The Savold Tire Corp., which has patented processes for rebuilding tires from the inner lining to the new tread, announced to-day its incorporation for $5,000,000 under the Delaware laws, and the additional formation of state corporations in New York, New Jersey and Delaware.

Starting with production in Chicago, the company has made plans for manufacture in ten other states under a process of selling territorial rights and leasing ovens for treating tires.

Wages Now and a Year Ago

WASHINGTON, June 29—The wage advance since a year ago in several industries is interesting. The following table is compiled from Department of Labor reports. Forty-eight automobile manufacturers reported a total payroll of 111,226 workers for March, 1919, as compared with 114,793 workers for March, 1918, a decrease of 3.1 per cent, but the payroll for March, 1919, was $3,291,213, as compared to $2,717,266 for the same month of the preceding year, an increase of 21.1 per cent.

The number employed for March, 1919, increased 2.6 per cent as compared with February, 1919, while the payroll for March, 1919, increased 1.7 per cent as compared with February of this year.

Following is a table showing comparison of employment in identical establishments in March, 1918, and March, 1919.

Kind of Factories	Number Reporting	Period of Payroll	Number on Payroll March 1918	Number on Payroll March 1919	Per Cent of Change	Amount of Payroll March 1918	Amount of Payroll March 1919	Per Cent of Total
Automobile manufacturing	48	1 week	114,793	111,228	— 3.1	$2,717,266	$3,291,213	+21.1
Boots and shoes	74	1 week	64,807	61,721	— 4.8	1,081,815	1,243,685	+15.0
Car building and repairing	39	½ month	44,459	43,652	— 1.8	1,871,658	2,389,750	+27.7
Cigar manufacturing	55	1 week	19,948	17,391	—12.8	269,070	283 419	+ 5.3
Men's ready made clothing	35	1 week	23,408	18,191	—22.3	417,456	393,345	— 5.8
Cotton finishing	18	1 week	15,084	11,360	—24.7	244,357	205,205	—16.0
Cotton manufacturing	56	1 week	51,999	50,153	— 3.6	705,178	702 577	— .4
Hosiery and underwear	67	1 week	34,200	27,221	—20.4	437,415	377,244	—13.8
Iron and steel	102	½ month	182,872	166,897	— 8.7	9,555,253	11,239,659	+17.6
Leather manufacturing	34	1 week	15,040	14,714	— 2.2	264,266	324,839	+22.9
Paper making	56	1 week	25 965	25,729	— .9	490,887	565,825	+15.3
Silk	48	2 weeks	15,648	14,761	— 5.7	440,230	509,652	+15.8
Woolen	49	1 week	48,141	24,625	—48.8	806,939	421,999	—47.7

Bold Thieves Caught Stealing A.E.F Cars

Officers Who Sold Machines at Ridiculous Prices Courtmartialed—Detection Bureau

PARIS, June 18 (*Special Correspondence*)—New American Army Cadillac cars have been sold in France for $300. Fords which have never seen service have been disposed of for $100 each. These cars were delivered to buyers in their boxes, just as they came off the steamer.

Unfortunately for the bargain hunters, no more machines can be secured at these advantageous prices, for the officer who organized the sales is now on his way back to the United States, and according to the judgment rendered by general court martial will not be demobilized for years. The Frenchmen who secured 1919 Cadillacs for $300 are now minus the cars and the cash.

In addition to this organized theft inside the service, there has been an epidemic of car stealing throughout France. In the advanced zone a group of 20 officers has been formed for the sole purpose of tracing missing army automobiles. During the past month they have averaged three finds a day.

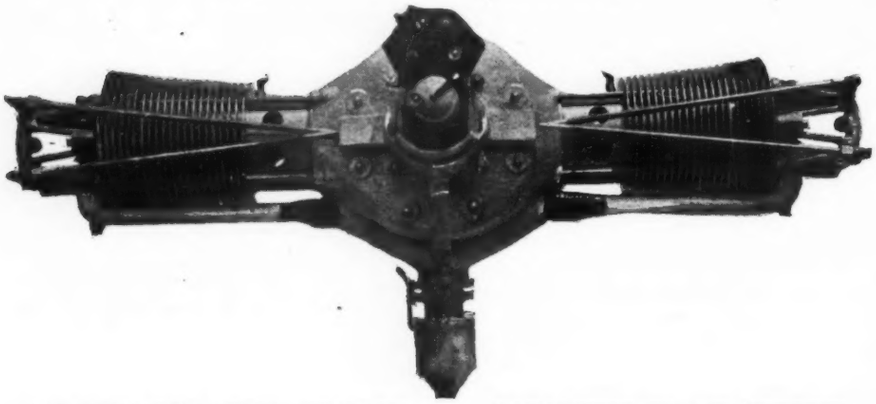
In the great majority of cases these cars had been abandoned by the roadside, owing to breakdown, and had been collected by economically-minded Frenchmen. They were stored in old barns, and in some cases artfully hidden under hay ricks until an opportunity presented itself for repairing them and offering them for sale. When the drivers came back and found the cars gone, they usually did not trouble very much, being under the impression that the machine had been towed home by some other organization, and that it would be reported within a few days.

During the active war period, when civilians could not drive cars, there was no danger of theft. Now that automobile travel is practically free from restrictions, carelessness generally means the loss of a machine. Any automobile left unattended by the roadside or in the street is liable to disappear, and owing to the boldness of the thieves, the police on this special work generally begin operations by showing their six-shooters. Among the cars stolen recently was the one used by General Harts, commanding officer of the District of Paris. The gang responsible for this and other army thefts has been captured.

PIERCE-ARROW NOT SOLD

BUFFALO, N. Y., June 30—Persistent reports here and in New York that the Pierce-Arrow Motor Car Co. had been sold were denied to-day by Charles Clifton and Walter C. Wrye, president and treasurer of the company. The officials declared they knew of no foundation for the report, though they admitted that control of the corporation might be obtained by stock purchases on the market.

Rear View of Cato Aviation Engine



$40,000,000 FOR ARMY AVIATION

WASHINGTON, June 30—The conferees for the Army appropriation bill have reduced the Senate appropriation of $55,000,000 for the Army Air Service to $40,000,000 The provisions authorizing the War Department to purchase the Curtiss airplane plant at Buffalo for use in experimental aeronautics and providing for the establishment of a dirigible station at Burlington, N. J., were rejected. The provisions for the purchase of the Dayton-Wright plant and land at Dayton, Ohio, and a field at San Diego, Cal., were also eliminated.

DINNER FOR FLYERS

NEW YORK CITY, July 2—In honor of Lieut.-Commander Albert C. Read and Commander John H. Towers of the United States Navy and the crew of the NC-4, which accomplished the first transatlantic flight, the American Flying Club is giving a dinner this evening in their honor at the Hotel Commodore at 8 o'clock.

EQUIPMENT IN AIR SERVICE

WASHINGTON, June 27—On May 21 the American Expeditionary Force in the zone of advance had 27 pursuit planes, 45 observation planes, a total of 72 on hand, and 16 pursuit and 31 observation planes available. The authorized strength for the army was 121 planes, including 25 pursuit and 96 observation so that the strength in planes was 60 per cent of the authorized.

SMALL CONTRACTS LIQUIDATED

WASHINGTON, June 24—Contracts valued at $53,000,000 were liquidated during the week ended June 7 at a cost of $11,800,000 or 22 per cent. This rate compares with 13.5 per cent for the contracts previously liquidated. Of these contracts less than 32 per cent were informal and were adjusted under a recent act of Congress which authorizes their settlement.

The largest contracts have not yet been liquidated as is indicated by the fact that 1745 contracts have been settled at an average value of $73,399 as compared with 7236 contracts awaiting liquidation and valued at $317,797 each.

FATALITIES IN AIR SERVICE

WASHINGTON, June 27—During the period from April 3 to June 12, 1919, there were over 19,000 hours flown in training in the United States Air Service, with 8 fatalities or 2380 hours per fatality. The apparent decrease in the fatality rate as compared with previous figures is due to the fact that the United States Air Service is dividing the fatalities into those resulting from training, and those other than training. A comparison of the fatality rates during previous periods is shown in the following table:

	Number	Hours Flown per Fatality
Training Fatalities:		
April 3 to June 12, 1919	8	2,380
Other Fatalities:		
April 3 to June 12, 1919	14	462
All Fatalities:		
June 1 to Nov. 11, 1918	156	3,149
Nov. 11 to Jan. 2, 1919	42	1,877
Jan. 2 to April 3, 1919	21	1,327
April 3 to June 13, 1919	22	1,160

BILL TO CHANGE U. S. BUREAUS

WASHINGTON, June 28—A bill to abolish the Department of Interior and substitute for it the Department of Public Works was introduced in the Senate yesterday by Senator W. L. Jones and in the House of Representatives by Representative E. F. Reavis.

The bill, which has the backing of all organized engineering societies in the country and the National Engineering Council, provides that all subsequent secretaries of the new department "shall by training and experience be qualified to administer the affairs of the department and to evaluate the technical principles and operations involved."

It would transfer the supervising architect's office, the construction division of the United States Army, river and harbor improvements, Mississippi River commission, the coast and geodetic survey, the bureau of public roads and forest reserve, patent office and bureau of education to the new department.

SEPARATE CORPS MAINTAINED

WASHINGTON, June 30—Conferees on the Army appropriation bill for 1920 have included provisions for a bill which will have the attention of Congress shortly, whereby the Air Service, Motor Transport Corps and Tank Corps will be maintained as distinctive organizations until June 30, 1920.

3,414 Army Planes Available for Use

Fifty Squadrons of Battle Craft Ready for Emergency, Air Service Reports

WASHINGTON, June 30—Army airplanes in commission or available for immediate service number 3414, according to an official announcement made by the War Department to-day.

A survey taken shows that to meet an emergency there would be 1240 battle planes available, sufficient to make 50 squadrons. Besides these there are in storage 862 battle planes which could be put into commission almost immediately, and 653 advance training planes in use now which could be used as observation planes if necessary. There are also 156 advance training planes in storage. A total of 52 squadrons of training planes could be assembled if necessary.

The complete resources of the Air Service in planes including battle advance training planes, are as follows:

Type	Designed for	Number in commission	In storage with motors taken out
DH-4	Observation day bombing	1,191	842
Spad	Pursuit	27	..
Le Pere	Service	18	..
Handley-Page	Bomber	4	20
S E 5	Advanced training	46	57
JN6-H	Advanced training	653	156
S4-C	Advanced training	400	..
Total		2,339	1,075

BIG NAVY DIRIGIBLE

WASHINGTON, July 1—The Navy Department will purchase a dirigible airship, probably of the Zeppelin type, either from Great Britain or Germany, for about $2,500,000, and will then build one at an estimated cost of $1,500,000, according to plans formulated at a conference held here yesterday between Secretary of the Navy Daniels, Admiral Taylor and Admiral Parks. The American ship will be built at a plant to be constructed on Government owned lands near Cape May.

ARMY CAR SALE RULING

WASHINGTON, June 27—In reply to requests for the sale of army motor vehicles in this country to Roumania, the War Department has advised the U. S. Liquidation Commission of Paris that there are no army cars or trucks in the United States available for sale abroad.

CHASSIS TAXED 3 PER CENT

WASHINGTON, July 1—To insure that motor truck chassis will only be taxed 3 per cent a bill has been introduced in Congress which amends section 900 of the revenue act to specifically place a 3 per cent tax on chassis and motor trucks.

India Buying American Cars

CALCUTTA, May 15 (*Special Correspondence*)—A local taxicab company has placed an order for 300 Overland cars to be used in cab service in this city. The order was placed after an exhibition of differentials and gears which had been used for more than 100,000 miles.

A local importer, in a discussion with several engineers, recently remarked that if the American builders would keep their eye on the body building proposition, paying more attention to local needs and less to their home designs, it would do more to kill the prejudice against American cars than any other single effort. The engineers with whom he was talking fully agreed with this statement.

There is believed to be a good field here for the use of American tractors for hauling firewood from the jungles to the various town centers. It is believed that a good many machines will be put to this use within the next few years. At present importers are carefully studying the various standard makes of tractors and trucks with a view of selecting the best unit for this particular work.

AERIAL BOARD CREATED

OTTAWA, June 27—An Aerial Board has been created in Canada under an act passed during the present session, with Hon. A. L. Sifton, chairman; General Mewburn and Hon. C. C. Ballantyne representing the militia and naval service departments respectively, as members; Lieut.-Col. C. M. Biggar, vice-chairman, and other members including: Dr. R. M. Coulter, Deputy Postmaster-General; J. A. Wilson, assistant deputy Minister of Naval Affairs, and Edward S. Busby, chief inspector of the Department of Customs and Inland Revenue.

The board will frame regulations regarding civil flying. Present regulations in force were passed under the War Measures Act and will lapse with the declaration of peace. It will supervise all matters connected with aeronautics; the control and management of aircraft necessary for the conduct of the public service; the fixing of routes of travel, etc.

DEPARTMENT OF FEDERAL HIGHWAYS

WASHINGTON, June 27—The establishment of a Department of Federal Highways and definite trunk-line roads across the United States, together with an appropriation of $1,700,000,000 for this work, are the chief provisions of a bill introduced in Congress yesterday by Representative Osborn of California. The bill differs to some extent from the Townsend bill, which provides for a Federal Highway Commission. Mr. Osborn's bill would create a Department of Federal Highways in place of a commission. It definitely states the number of trunk lines to be established, specifically names the officers and their salaries, increases the appropriation from $450,000,000 to $1,700,000,000 to be appropriated in 7 years. It also grants the power to appropriate highways anywhere in the United States by condemnation.

It is a bill creating a Department of Federal Highways with a secretary in charge, similar to the other Government department and cabinet positions, and provides for the establishment of not less than three main trunk-line roads from the Atlantic Ocean to the Pacific Ocean and not less than four main trunk-line roads from the northern to the southern boundary of the United States. It includes also not less than two main trunk-line roads in each state, together with intersecting roads connecting the entire National Highway System. Construction, maintenance, repair and improvements, together with the selection of these highways, will be the duty of the secretary of the department.

BALL BEARINGS TAXABLE

WASHINGTON, June 28—Ball bearings are not subject to the revenue tax of 1918 unless intended especially for cars, trucks, motorcycles or as accessories for such vehicles, according to a notice from the office of the Commissioner of Internal Revenue, which states:

"That ball bearings are not subject to the excise tax imposed under section 900, subdivision 3, of the Revenue Act of 1918, unless they are primarily designed or constructed to be used as a component part of an automobile truck, automobile wagon, other automobile, motorcycle, or parts of accessories for such vehicles."

CANADIAN NATIONAL HIGHWAY

NEW WESTMINSTER, B.C., June 27—There has been proposed in Canada a national highway that would reach from the shores of the Atlantic in the Maritime Provinces to the waters of the Pacific in British Columbia. The road proposed would follow the National Transcontinental railway from the Atlantic to Winnipeg, and the Canadian National Railway from the Manitoba metropolis to Vancouver.

Chinese Agent Here Investigating

WASHINGTON, June 28—Kingsu Whang, formerly a member of parliament in China and now here as special commissioner for investigating economic conditions in America, called at the Foreign Trade Department of the National Automobile Chamber of Commerce as he is especially interested in the automotive industries. He says China is awakening to the need for better roads and the efficiency of motor transportation. According to Mr. Whang, there are more than 1,000,000 Chinese soldiers in the army, most of whom will be put to road building during the coming year.

MOTOR PLOW FOR SMYRNA

LONDON, June 28—Writing from Smyrna, a British trade paper correspondent says there is need in the Near East, newly liberated from Turkish rule, for a small motor plow, operated directly from the engine instead of being hauled by a tractor. It would be used particularly between trees in orchards and vineyards, and between rows of root and ground crops in market garden plantations, as well as in the stubble of the open field. Such a contrivance, the correspondent says, would appeal to every farmer in the Near East, where the bulk of the farms are small.

INCREASE IN LABOR SHORTAGE

WASHINGTON, June 27—A decrease of labor surplus and an increase of labor shortage was reported to the Department of Labor during the week ended June 21 from 89 cities in the United States. A surplus of labor was reported amounting to 208,693 as compared with a surplus shown by 100 cities in the previous week of 241,046. A shortage of labor amounting to 13,687 was reported by 17 cities compared with 12,765 in the week previous reported by 19 cities.

Twenty-three cities report equality; 17 a shortage and 39 a surplus. New England reports indicate a surplus slightly in excess of the shortage; New York City reports a surplus of 100,000 and the steel centers a small shortage. Chicago reports a surplus of 50,000; Rockford, Ill., an equality; Detroit a shortage of 4000; Akron a shortage of 2000; Cleveland, an equality; Youngstown, a surplus; Kansas City, an equality; Memphis, a shortage; Dallas, an equality and the Pacific Coast cities slight surpluses.

Oil Exports for May and Eleven Months Ended May, 1919

WASHINGTON, June 28—Exports of mineral oils show a decrease for May, 1919, as compared with May, 1918. The May, 1919, exports total 177,566,922 gal., valued at $25,933,135 as compared to the May, 1918, exports, which amounted to 239,515,961 gal., at $31,225,541. Exports decreased from 54,780,414 gal. in May, 1918, to 26,084,283 gal. in May, 1919. Following are the exports for May, and for 11 months ended May:

	MAY				ELEVEN MONTHS ENDED MAY			
	1919		1918		1919		1918	
	Gallons	Value	Gallons	Value	Gallons	Value	Gallons	Value
Crude mineral oil	7,443,401	$392,243	17,374,048	$967,586	153,094,757	$9,328,298	161,372,430	$7,942,678
Illuminating oil	78,307,580	9,663,185	34,516,749	3,671,365	599,661,939	66,595,482	496,287,961	44,073,146
Lubricating oil	20,769,887	6,459,978	25,617,187	6,893,259	249,705,579	78,605,826	245,682,840	59,694,020
Gasoline, naphtha, etc	26,084,233	7,031,620	54,780,414	13,761,318	436,482,335	109,069,651	420,946,788	102,282,797
Residuum, fuel oil, etc	44,901,771	2,386,109	107,227,563	5,932,013	846,341,408	47,554,027	1,128,476,923	55,955,630
Total	177,506,922	$25,933,135	239,515,961	$31,225,541	2,285,286,018	$311,153,284	2,452,766,942	$269,948,271

KEYSTONE ADDS 2 DIRECTORS

Benjamin Lissberger and Walter Loewenthal have been added to the board of directors of the Keystone Tire & Rubber Co. Mr. Lissberger is connected with B. Lissberger & Co., and with the Eagle Smelting & Refining Works. Mr. Loewenthal is also secretary of the Keystone company.

A. W. King, vice-president and plant superintendent of the Pontiac Body Co., has resigned. He will take a long vacation before making another connection.

C. W. Jinnette will have charge of the branch office of the Norton Co., Worcester, Mass., which has recently been opened in Detroit. Mr. Jinnette has been Detroit representative of the company for a number of years.

W. E. Schroen, formerly connected with the Kansas City branch of the Federal Rubber Co., has been placed in charge of that company's warehouse recently opened in Omaha, Neb.

Coxie E. Cook, who has been with the B. F. Goodrich Rubber Co. for 21 years, has been placed in charge of the mechanical rubber goods sales of the company. He was previously in charge of the company's Pacific Coast office at San Francisco and more recently has been in the Akron plant in connection with branch operating work.

Carl H. Pelton, assistant to the president of the Maxwell Motors Co., Inc., and secretary of the Maxwell Motor Sales Corp., has resigned, to take effect July 1. He has made no announcement of future plans.

J. L. Justice, for three years connected with the Maxwell Motor Corp. as supervisor, has resigned to become general sales manager for the National Wire Wheel Works, Geneva, N. Y. He will have general offices in Detroit.

Cecil B. Warner has been appointed chief engineer of the Nelson Motor Truck Co., Saginaw, Mich. For the past five years he has been connected with the engineering staff of the Gramm-Bernstein Motor Truck Co., Lima, and was formerly with the Warner Gear Co., Muncie, Ind., and with the Willys-Overland Co., Toledo.

Hector C. Adam, for five years in the sales department of the International Motor Co., and formerly truck sales manager of the Packard Motor Car Co., has now become one of the directors of Morris, Russell & Co., Inc., 14 Church Street, New York City, exporters of automotive products. He has just returned from Paris and London. In London he formed the British-American Industries, Ltd., which will take care of the manufacture and sale in Great Britain, France and Italy of automotive products made in this country.

CRUCIBLE STEEL FACTORY

CLEVELAND, June 28—The Crucible Steel Castings Co. will start construction work on a factory to cost about $100,000.

Men of the Industry

Changes in Personnel and Position

E. Friis Hansen, Copenhagen, Denmark, who has for some time been distributing Universal marine engines and generating sets in his country, recently made his annual visit to America. He says there is a growing demand for American products in Scandinavia.

H. H. McCliskey has been appointed second assistant treasurer of the Goodyear Tire & Rubber Co., Akron. He has been with the company since 1902, and in 1910 was made cashier, which position he held until his present promotion.

Elliot Reid, formerly assistant to the general manager of the Westinghouse Lamp Co., has been made sales manager of the company.

J. Gustaf V. Lang, manager of the export department of the Master Trucks, Inc., Chicago, will leave New York on July 8 for a business trip to Scandinavia.

Richard A. Oglesby has recently become identified with the sales organization of the Eisemann Magneto Co. He was chief engineer of the Quick Action Ignition Co. until he entered government service as 1st lieutenant in the Ordnance department. He was president of the National Gas Engine Association from 1914 to 1916.

O. W. Loew, who was for several years superintendent of the Globe Machine & Banding Co. and the Gabriel Mfg. Co., Cleveland, and later with the Hayes Mfg. Co., Detroit, has been appointed production engineer of the New Era Spring & Specialty Co., Grand Rapids.

Forrest W. Boswell, managing secretary of the Flint Vehicle Factories Mutual Benefit Association since 1916, has been appointed head of the personal service department of the Buick Motor Co., to succeed Howard J. Clifford, who resigned.

Harry H. Rowe, for the past 14 years branch manager of the Burroughs Adding Machine Co., has become general manager of the Detroit Radiator Corp., with executive offices at 435 Woodward Avenue.

Thomas O'Brien, New York City, is in charge of the truck sales department of the Olds Motor Works, Lansing. He succeeds A. L. A. Spetler, who went to Minneapolis to become general manager of the Northwestern Oldsmobile Co.

George B. Hopkins, Kalamazoo, Mich., formerly with the Victoria Wire Wheel Co. of that city, has been made assistant to A. C. Barley, president of the Barley Motor Car Co.

NEW M. A. M. A. WORKER

NEW YORK, July 2—M. Lincoln Schuster, formerly in publicity and statistical work with the Treasury Department at Washington, has joined the staff of the Motor & Accessory Manufacturers' Association as general assistant to Manager Hemingway.

L. G. Peed, who for the past 6 months has been acting as general sales manager of the New York Willys-Overland branch, has been appointed assistant manager of the eastern division.

Homer L. Schneider, for the past four years general manager of the Republic Motor Sales Co., Cleveland, has joined the truck sales division of the Grant Motor Car Corp., Cleveland.

William Fore, formerly service manager of the Fisk Rubber Co., has taken over the Fisk service station, Detroit, and will operate it under the name of the Super Tire Service Co.

William G. Dence, superintendent of Plant No. 1 Electric Auto-Lite Corp., Toledo, is dead. He was connected wtih the Auto-Lite company since 1914. Prior to that time he was identified with the Saxon Mfg. Co. and other Toledo interests.

STRIKE AT JACKSON METAL PRODUCTS

JACKSON, MICH., June 28—The Jackson Metal Products Co. plant is tied up by a strike. Nearly the whole working force walked out when the company did not grant them a 48-hr. week with 54-hr. pay. The company manufactures hoods, radiators, and fenders.

15 CARS IN RACE

NEW YORK, July 3—Fifteen cars, among them the Peugeot in which Howard Wilcox won the Indianapolis sweepstakes May 31, are entered in the 100-mile race to be run Independence Day over the Sheepshead Bay Speedway.

A secondary event will bring together in three 10-mile heats Wilcox and Ralph de Palma, winner of the 1915 Indianapolis classic and holder of the American 500-mile title. De Palma will drive a Packard.

Aside from Wilcox and de Palma, the contenders in the principal event for a purse of $10,000, will be: Joe Thomas, Mercer; Dennis Hickey, Stickle; Emil Thomas, Wehr; Ed. O'Donnell, Deusenberg; Tom Milton, Deusenberg; William Zetere, Deusenberg; Dave Lewis, Meteor; Ira Vail, Hudson; Joe Boyer, Frontenac; Gaston Chevrolet, Frontenac; Ray Howard, Peugeot; Bennet Hill, Aetna. A second Aetna has been entered, the pilot to be assigned.

UNION STEEL PRODUCTS BUILDING

ALBION, MICH., June 28—The Union Steel Products Co. is building a two-story addition, 80 by 100 ft. When the new unit is complete the number of men on the payroll will be increased by 200.

NEW DENBY TRUCK

DETROIT, June 28—The Denby Motor Truck Co., which has been specializing in vehicles for inter-city and rural express routes, will put out a new Model 25, 2½ to 3 tons, especially adapted to express purposes. It has a 35-hp. motor, 4-speed transmission, taking a maximum reduction of 52 to 1 on low, special frame length and wheelbase.

SAGINAW PRODUCTS NOW

JACKSON, MICH., June 27—The Jackson-Church-Wilcox Co., now a unit of the General Motors, has changed its name to the Saginaw Products Co., and has included in its manufacturing organization the Jacox steering gear plant, the engine plant and the Central Foundry.

RUBBER CO. INACTIVE

NEW YORK, June 28—The Intercontinental Rubber Co. has closed its factory at Torreon, Mexico, owing to unsettled conditions in the country and the prevailing low price of crude rubber. It was said that stocks were sufficient to maintain sales for several months.

U. S. TRACTOR IN PLANT

MENASHA, WIS., June 28—The U. S. Tractor Co., which recently moved here from Chicago, has started assembling operations in a part of its new plant, which will be completed by July 10.

COMPANIES MAKING TRAILERS

NEW YORK, June 28—Several companies manufacturing trucks have added special models to their line for hauling trailers, according to the Trailer Manufacturers' Association of America. This has been done by Pierce-Arrow, International Motor, Garford, G.M.C., Locomobile, Sterling, Gramm-Bernstein, Indiana, Service, J. C. Wilson, Acme, Winther, Master, Fulton, Armleder, Morel, Koehler, Day-Elder and Oneida.

The Southern Motor Mfg. Association, Houston, Tex.; Wm. G. Hesse & Son Mfg. Co., Leavenworth, Tex., and the Los Angeles Trailer Co., Los Angeles, joined the association during the past month.

LOTEX FACTORY PLANNED

FOND DU LAC, WIS., June 28—The Lotex Tire Co., a new $100,000 corporation, will award contracts within a week or 10 days for its new factory, to cost $45,000. The main shop will be 45 x 200 ft., with a wing, 60 x 80 ft.

VICTOR RUBBER OFFICE

SPRINGFIELD, ILL., June 28—The Victor Rubber Co. of this city has opened a branch at 1720 South Michigan Avenue, Chicago.

AHLBERG PITTSBURGH BRANCH

CHICAGO, June 27—A new branch of the Ahlberg Bearing Co. has recently been opened in Pittsburgh.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

G.M.C. ST. LOUIS BUILDING

ST. LOUIS, MO, June 27—St. Louis Manufacturing Corp., a subsidiary of General Motors, will erect two buildings on Natural Bridge Avenue, near Union Boulevard, at a combined estimated cost of $507,608. Work has been started on a power house at this site to cost $500,000. The investments of this G. M. C. branch, including equipment, will amount to approximately $2,200,000.

VIM TO BUILD COMPLETE TRACTOR

SCHLEISINGERVILLE, WIS., June 28—The Vim Tractor Co., which recently took over the Standard Machinery Co. of this city, will enlarge the gas engine works at a cost of $30,000 to provide facilities for building complete tractors.

WOLVERINE MANUFACTURING

KALAMAZOO, MICH., June 28—The Wolverine Motor Car Co., which suspended business on account of the war, is being revived and the manufacture of cars will start soon. The capital stock, $250,000, is to be sold at once. A coupe and a touring model selling at $4,000 are now made.

NASH FACTORY ADDITION

KENOSHA, WIS., June 28—The Nash Motors Co. awarded contracts last week for the construction of a 1-story building, 100 x 200 ft., which will cost about $75,000 with equipment.

BRISCOE CARBURETER

PONTIAC, MICH., June 28—Work on the new plant of the Briscoe Carbureter Co. is nearing completion. Manufacturing operations will not begin in 60 days. Approximately 50 men will be employed at the start. This company recently moved to this city from Jackson.

HUDSON WILL BUILD

DETROIT, June 27—The Hudson Motor Car Co. will build a brick and steel frame 400 x 210 ft. factory on the north side of Waterloo Street at a cost of $220,000.

FOUNDRY FOR MOTOR CASTINGS

MILWAUKEE, June 28—Work will begin shortly on the construction of the new foundry of the Motor Castings Co., which will be 115 x 180 ft., and cost about $65,000.

FOUNDRY FOR OWOSSO

OWOSSO, MICH., June 25—Ground will be broken shortly for a foundry 40 x 100 ft. to be put up by the Owosso Bronze Bearings Co.

1½-TON CLYDESDALE

CLYDE, OHIO, June 27—The Clyde Cars Co. has brought out two lighter models of its Clydesdale trucks, No. 32 and 42 respectively. No. 32 is a 1-ton, and No. 42 a 1½-ton capacity. Both have the same constructional features as the heavy models but are designed especially for delivery work and lighter loads.

HACKETT PRODUCTION

GRAND RAPIDS, MICH., June 25—The Hackett Motor Car Co. is now producing 12 cars a week. The company will bring out a new series of open and closed models this fall. At present 50 men are employed. Officials say production will reach capacity in about 60 days. The company is located in its 500 x 70 ft. plant.

UNITED MOTORS ADDS BRANCHES

DETROIT, June 27—The United Motors Service, Inc., which is the service branch of the General Motors Corp., now operates 16 branches and by Jan. 1, 1920, seven more branch offices will be established, bringing the total up to 23. New places will be opened in Portland, Omaha, Dallas, New Orleans, St. Louis, Pittsburgh and Buffalo.

General offices will be maintained in Detroit under the supervision of Ralph S. Lane, president of the United Motors Service, Inc.

NESBIT PATENT PROTECTED

NEW YORK, July 1—A permanent injunction restraining the Perkins Windshield Co. from using in manufacture or offering for sale a windshield improvement patented by Theodore D. Nesbit has been granted by Federal Judge Hand in favor of Mr. Nesbit as president and treasurer of the Tonneau Shield Co., Inc. The decree not only protects the Nesbit patents, but provides for recovery by the plaintiff of the defendant's profits accruing since Sept. 4, 1917, from the use of the invention. William C. Parkin was appointed commissioner to take evidence regarding the extent of the Perkins Co.'s violation of Nesbit's patent rights, in order to determine the amount of damages.

MICHELIN INSURES EMPLOYEES

MILLTOWN, N. J., June 28—All employees of the Michelin Tire Co. have received an individual life insurance policy for varying sums, depending on their years of service with the company, according to J. Hauvette-Michelin, vice-president and United States director of the concern.

By this plan every employee of the company in every one of its various factories received free of cost a life insurance policy graded according to length of service from $200 for six months to $1,200 for ten years and over. Each new employee will be insured upon completion of his first six months with the company. Each employee received an individual policy which became effective on June 16.

Calendar

SHOWS

Aug. 30-Sept. 6—Minnesota. State Fair.
Sept. 1-6 — Indianapolis, Ind. State Fair, Cars and Accessories, Indianapolis Automobile Trade Assn., John B. Orman, Manager.
Sept. 13-20—Cincinnati, O. Ninth Annual, Music Hall, Cincinnati Automobile Dealers' Assn., H. K. Shockley, Manager.
Sept. 15-20 — Springfield, Mass. Eastern States Exposition.
*Oct. 9-19—Paris. Grand Palais, International Automobile Mfrs. Congress.
Nov. 3-8—Chicago, Ill. Business Exhibit of Automotive Equipment Assn., Medinah Temple.
Nov. 7-16—London. Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.
December — Brussels. International Automobile Mfrs. Congress.
January — New York. International Automobile Mfrs. Congress.
Jan. 3-10 — New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce, S. A. Miles, Manager.
Jan. 24-31—Chicago, Ill. Coliseum, Cars; Drexel Pavilion, Trucks; National Automobile Chamber of Commerce, S. A. Miles, Manager.
February — Chicago. International Automobile Mfrs. Congress.
Feb. 23-Mar. 6 — Birmingham, Eng. British Industries Fair.

TRACTOR SHOWS

July 14-19—Wichita, Kan. Automotive Committee of National Implement Assn.
July 28-29—Columbus, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.
Aug. 1-2 — Piqua, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.
Aug. 18-22—Aberdeen, S. D. Sectional Tractor Demonstrations.
Sept. 9-12—Streator, Ill. Northern Illinois Tractor & Truck Assn.
Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.
October—Ottawa, Ont., Can. Interprovincial Plowing Match and Tractor Demonstration.
Oct. 14-16—Ottawa, Ont. Tractor and Farm Machinery. Experimental and Booth Farms.

CONTESTS

July 4—Hohokus, N. J. Dirt Track Event.
July 4—Tacoma, Wash. Annual speedway races.
July 4—Atlantic City, N. J.—Airplane races—Aeronautic Convention.
July 4—Sheepshead Bay, L. I. Speedway race.
July 19—Uniontown, Pa. Speedway race.
*Aug. 15 — Middletown, N. Y. Dirt track event.
*Aug. 22-23—Elgin, Ill. Road race.
*Aug. 23—Sheepshead Bay, L. I. Speedway race.
*Sept. 1—Uniontown, Pa. Speedway race.
*Sept. 20—Sheepshead Bay, L. I. Speedway race.
*Sept. 27—Allentown, Pa. Dirt track event.
*Oct. 1—Cincinnati, O. Speedway race.
*Oct. 4—Trenton, N. J. Dirt track event.
*Oct. 11—Danbury, Conn. Dirt track event.

*Tentative dates.
†Sanctioned.

CONVENTIONS

June 16-19—Detroit. American Society of Mechanical Engineers spring meeting, Hotel Statler.
June 23-28—Ottawa Beach, Mich. S. A. E. Mid-summer Meeting.
July 9-10—Buffalo. Motor and Accessory Mfrs. Assn. Mid-summer convention.
Sept. 22-24—Philadelphia. Annual Convention, National Association of Purchasing Agents. Bellevue - Stratford.
Nov. 3-8—Chicago, Ill. Convention, Automotive Equipment Assn., Medinah Temple.
May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.
January — Washington. Pan American conference.

EQUAL PAY FOR WOMEN URGED

(*Continued from page* 42)

assist local education authorities in determining the technical instruction which should be provided for the women.

A Basic Wage for Women

18—That in order to secure and maintain physical health and efficiency, no normal woman should be employed for less than a reasonable subsistence wage.

19—That this wage should be sufficient to provide a single woman over 18 years of age, in a typical district where the cost of living is low, with an adequate dietary, with lodging, to include fuel and light in a respectable house not more than half an hour's journey, including tram or train, from the place of work, with clothing sufficient for warmth, cleanliness and decent appearance, with money for fares, insurance and trade-union subscriptions, and with a reasonable sum for holidays and amusements, etc.

20—That there should be additions to this wage for women working in the larger towns and in London to cover the greater cost of living there.

21—That this wage should be adjusted periodically to meet variation in the cost of living.

22—That the determination of the basic subsistence wage should be by a specially constituted authority, which should also determine variations from it to meet the conditions of different districts and of different times, or in rare cases, special conditions of trade.

23—That the subsistence wage so determined should be established by statute to take effect immediately on the expiry of the Wages (Temporary Regulation) Act, 1918, or any prolongation of it and to apply the employment for gain in all occupations (other than domestic service) for which a minimum wage has not been determined by an industrial council or by a trade board or other statutory authority.

Mother's Pensions—Girls and Boys

24—That the Government should give consideration to the question of adopting a scheme of mothers' pensions for widows and for deserted wives with children, and for the wives and children of men physically or mentally disabled, such pensions to be granted only after investigation where there is need and subject to supervision, and otherwise to be administered on the lines followed for pensions granted to the widows of men deceased in war.

25—That the department or departments of government concerned should draw up for the consideration of the government a scheme by which the entire direct costs involved by the lying-in of women under thoroughly satisfactory conditions should be provided by the State.

26—That a scale of wages should be established for girls 50 cents a week less than the women's subsistence wage for each year under 18, and that no girl should be employed for gain at lower rates than those of this scale unless a duly constituted authority, such as a trade board or industrial council fixes such lower rate where the employment is of the nature of an apprenticeship. Also that the question of girls and boys under 16 working on piece should be specially considered by the department or departments of government concerned with a view to the definite abolition of such working if it is found to be detrimental to health.

27—That the Government should continue to give the strongest possible support to proposals for the international regulation of labor conditions which should lessen the danger of foreign trade of this country being injured as a result of the employment of underpaid labor abroad.

The main conclusions of the minority report, signed by Mrs. Sidney Webb, are:

That the existing relations between the conditions of employment of men and women are unsatisfactory.

That for the production of commodities and services, women no more constitute a class than do persons of a particular creed or race.

That the time has come for the removal of all sex exclusions, for the opening of all posts and vocations to any individual qualified for the work, irrespective of sex, creed, or race, and for the insistence upon the same qualifications, the same conditions of employment and the same occupational rates for all persons engaged in any particular pursuit.

That the formula "Equal pay for equal work," is ambiguous and easily evaded.

That the essential principle which should govern all systems of remuneration is that of clearly defined occupational or standard rates to be prescribed for all the persons of like industrial grade, and whether computed by time or piece, to be settled by collective agreement between representative organizations of the employers and the employed, and enforced (but as minima only) on the whole grade or vocation that a national minimum, at least as regards rest time, education, sanitation and subsistence should be prescribed by law and systematically inforced, in which national minimum there should be no sex inequality.

That some form of State provision is necessary, entirely apart from wages, of which the present maternity benefit, free schooling, and income tax allowance constitute only the germ.